FINAL MITIGATION PLAN

Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina
DENR Contract No. D12010S
SCO No. 07-07088-03
EEP ID No. 94903

New River Basin
HUC 05050001

Prepared for:

Ecosystem Enhancement PROGRAM

NC Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
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Prepared by:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Phone – 704-332-7754

Christine D. Blackwelder
CBlackwelder@wildlandseng.com
Emily Reinicker, PE, CFM
EReinicker@wildlandseng.com

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EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) is completing a design-bid-build project for the North Carolina Ecosystem Enhancement Program (EEP) to restore, enhance, and preserve a total of 14,736 existing linear feet (LF) of perennial and intermittent stream in Alleghany County, NC. The streams proposed for restoration, enhancement, and preservation include Little Pine Creek, a third order stream, as well as an unnamed second order tributary to Little Pine Creek (UT2), an unnamed first order tributary to Little Pine Creek (UT2A) and four unnamed zero order tributaries to Little Pine Creek (UT1, UT2B, UT3, and UT4). Enhancement is also proposed on 2.3 acres of existing wetlands. The project is being completed to address historical livestock and farming impacts and improve project stream and wetland conditions while providing stream and wetland mitigation units (SMUs and WMUs) in the New River Basin. Buffer restoration will also take place but is not intended for mitigation credit at this time.

The Little Pine Creek III Stream & Wetland Restoration Project (Project) is located in the EEP Little River & Brush Creek Local Watershed planning area. The Project is within Hydrologic Unit Code (HUC) 05050001030030 which was identified as a Targeted Local Watershed in EEP's 2009 New River Basin Restoration Priority (RBRP) plan. The Local Watershed Plan (LWP) identified the following major stressors in the watershed: unforested buffers that are heavily grazed; livestock access to the streams; heavily eroded stream banks; land-disturbing activities on steep slopes; and storm water runoff in and around the town of Sparta. The Little Pine Creek III Stream & Wetland Restoration Project was identified in the LWP as a stream and wetland restoration opportunity with the potential to improve water quality, habitat, and hydrology within the Brush Creek watershed (site identifiers LPC1-04, LPC1-W10). LPC1-04 is the second highest ranked stream project of sixty five identified in the watershed. In addition to being a high priority site, the Little Pine Creek III site is located in close proximity to other established restoration projects with protected conservation easements. The Little Pine Creek II Stream Restoration Project is located approximately 2,500 linear feet (LF) upstream of the Little Pine Creek III site, while the Brush Creek stream restoration site begins at the downstream Little Pine Creek III project boundary.

The proposed Project will provide numerous ecological benefits within the New River Basin. While many of these benefits are limited to the Little Pine Creek III project area, others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat have more far-reaching effects. The design will not result in adverse impacts to wetlands.

This mitigation plan has been written in conformance with the requirements of the following:

- Federal rule for compensatory mitigation project sites as described in the Federal Register Title 33 Navigation and Navigable Waters Volume 3 Chapter 2 Section § 332.8 paragraphs (c)(2) through (c)(14).
- NCDENR Ecosystem Enhancement Program In-Lieu Fee Instrument signed and dated July 28, 2010.

These documents govern EEP operations and procedures for the delivery of compensatory mitigation.

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1.0 Restoration Project Goals and Objectives

The Project is located in the EEP Little River & Brush Creek Local Watershed planning area (http://portal.ncdenr.org/web/eep/rbrps/new). The Project is located in Hydrologic Unit Code (HUC) 05050001030030 which was identified as a Targeted Local Watershed in EEP's 2009 New River Basin Restoration Priority (RBRP) plan and is identified in the Little River & Brush Creek Local Watershed Plan (LWP) Project Atlas (LPC1-04, LPC1-W10).

EEP developed a LWP for the 111-square mile drainage area that included land use analysis, water quality monitoring and stakeholder input to identify problems with water quality, habitat and hydrology. The Little River watershed (HUC 05050001030030) and Brush Creek watershed (HUC 05050001030020) are characterized as primarily agricultural and mixed hardwood forest lands and Brush Creek has a history of habitat degradation issues due to embedded riffles and a lack of functional riparian areas. EEP completed the Little River & Brush Creek LWP in June 2007.

The Little River & Brush Creek LWP identified the following major stressors in the watershed: unforested buffers that are heavily grazed; livestock access to streams; heavily eroded stream banks; land-disturbing activities on steep slopes; and storm water runoff in and around the town of Sparta. The LWP identified the Little Pine Creek III Stream & Wetland Restoration Project (LPC1-04, LPC1-W10) as a stream and wetland restoration opportunity with the potential to improve water quality, habitat, and hydrology within the Brush Creek watershed.

The primary goals of the Little Pine Creek III Stream & Wetland Restoration Project address stressors identified in the LWP and include the following:

- Restore unforested buffers;
- Remove livestock from buffers;
- Remove livestock from streams;
- Repair heavily eroded stream banks and improve stream bank stability;
- Reforest steep landscape around streams; and
- Enhance wetland vegetation.

Secondary goals include the following:

- Remove harmful nutrients from creek flow;
- Reduce pollution of creek by excess sediment;
- Improve in-stream habitat; and
- Improve aesthetics.

The primary and secondary project goals will be addressed through the following project objectives:

- Restoring 26.3 acres of forested riparian buffer;
- Fencing off livestock from 57.32 acres of buffer and 14,736 LF of existing streams;
- Stream bank erosion which contributes sediment load to the creek will be greatly reduced, if not eliminated in the project area. Eroding stream banks will be stabilized by increased woody root mass in banks, reducing channel incision, and by using natural channel design techniques, grading, and planting to reduce bank angles and bank height;
- Steep, unforested landscape within the conservation easement will be reforested;
- 8 of the 9 onsite wetlands will be enhanced with supplemental plantings;
- Flood flows will be filtered through restored floodplain areas, where flood flow will spread through native vegetation. Vegetation uptakes excess nutrients;

- Storm flow containing grit and fine sediment will be filtered through restored floodplain areas, where flow will spread through native vegetation. The spreading flood flows will reduce velocity, allowing sediment to settle out;
- In-stream structures will promote aeration of water;
- In-stream structures will be constructed to improve habitat diversity and trap detritus. Wood structures will be incorporated into the stream as part of the restoration design. Such structures may include log drops and rock structures that incorporate woody debris; and
- Site aesthetics will be enhanced by planting native plant species, treating invasive species, and stabilizing eroding and unstable areas throughout the project.

2.0 Project Site Location and Selection

2.1 Directions to Project Site

The Project is located in eastern Alleghany County, NC as shown in Figure 1. The site is approximately eight miles east of the Town of Sparta, NC and approximately four miles south of the Virginia border east of Big Oak Road. The proposed project is located in an active cattle pasture surrounded by woods and agriculture.

Heading north on Interstate 77 north of Elkin, NC, take exit 83 to merge onto US-21 Bypass N toward Roaring Gap/Sparta. Continue to travel on US-21 for approximately 22 miles, and then turn right onto Stoker Road. Travel approximately 1 mile and take a slight right onto Glade Valley Road. Travel approximately 4.5 miles and turn left onto Big Oak Road. Travel approximately 1 mile and cross Little Pine Creek. The project site is located upstream of the Big Oak Road stream crossing. Farm gates on the right hand side of the road provide access to the site.

2.2 Site Selection and Project Components

The site was selected based on the current degraded condition of the onsite streams and wetlands and the potential for functional restoration described in Section 1.0. Credit determinations are presented in Section 9.0.

The streams proposed for restoration and enhancement include Little Pine Creek (Little Pine) and six unnamed tributaries: UT1, UT2, UT2A, UT2B, UT3, and UT4 (Figure 3). Both Little Pine and UT2 were broken into 3 reaches each (LP1, LP2A, & LP2B for Little Pine and UT2-1, UT2-2, and UT2-3 for UT2) based on geomorphic differences. The project also includes enhancement of degraded wetlands located adjacent to Little Pine and three of the unnamed tributaries. The project streams ultimately flow into Brush Creek which is part of the New River Basin. Photographs of the project site are included in Appendix 1. Numbered photo locations are included on Figure 7.

3.0 Site Protection Instrument

The land required for construction, management, and stewardship of the mitigation project includes portions of the parcel(s) listed in Table 1.

Table 1. Site Protection Instrument
EEP Mitigation Plan Template

Landowner	PIN	County	Site Protection Instrument	Deed Book and Page Number	Acreage Protected
Jeffery C. Anders	4011-32-9308	Alleghany	Conservation Easement	DB: 344 PG: 655[1]	0.20
Jeffery C. Anders	4011-21-5796	Alleghany	Conservation Easement	DB: 342 PG: 1146[1]	20.88
Eddie G. Edwards	4011-12-7050	Alleghany	Conservation Easement	DB: 159 PG: 101(1)[2]	2.75
Eddie G. Edwards	4011-11-1448	Alleghany	Conservation Easement	DB: 159 PG: 101(2)[2]	
Eddie Gene Edwards & Joye G. Edwards	4011-10-4454	Alleghany	Conservation Easement	DB: 107 PG: 632[2]	5.77
Eddie Gene Edwards & Joye G. Edwards	4010-29-6308	Alleghany	Conservation Easement	DB: 351 PG:353[2]	1.20
Eddie G. Edwards and wife, Joye G. Edwards	4010-19-1603	Alleghany	Conservation Easement	DB: 191 PG: 765[2]	8.98
Eddie G. Edwards and wife, Joye G. Edwards	4010-29-0451	Alleghany	Conservation Easement	DB: 234 PG: 1360[2]	4.76
Frances R. Huber	4010-99-4066	Alleghany	Conservation Easement	DB: 174 PG:154[2]	6.24
Thomas E. Rector	4010-28-5022	Alleghany	Conservation Easement	DB: 102 PG: 191[2]	6.54

1: Deed Book and Page Number provided for conservation easement.
2: Deed Book and Page Number provided for the property parcel.

All site protection instruments require 60-day advance notification to the Corps and the State prior to any action to void, amend, or modify the document. No such action shall take place unless approved by the State.

4.0 Baseline Information –Project Site and Watershed Summary

Table 2 presents the project information and baseline watershed information. The watershed areas were delineated on the USGS 7.5-minute topographic quadrangles.

Table 2. Project and Watershed Information
Little Pine Creek III Stream & Wetland Restoration

Project County	Alleghany County									
Easement Area (acres)	57.32									
Project Coordinates	36° 30' 29.16'' N, 81° 0' 6.12''W									
Physiographic Region	Blue Ridge Belt of the Blue Ridge Province									
Ecoregion	Blue Ridge – New River Plateau									
River Basin	New									
USGS HUC (8 digit, 14	05050001, 05050001030030									
NCDWQ Sub-basin	05-07-03									
NCGIA Land Use Classification[2]	Managed Herbaceous (74%), Mixed Upland Hardwoods (20%), Mixed Hardwoods/Conifers (5%), Southern Yellow Pine (<1%), Mountain Conifers (<1%)									
Reaches	LP1	LP2A	LP2B	UT1	UT2-1	UT2-2	UT2-3	UT2A	UT2B	UT3	UT4
Drainage Area (acres)	2,496	2,752	2,784	28	75	185	196	89	19	23	33
Drainage Area (miles^2)	3.7	4.0	4.1	0.04	0.11	0.27	0.29	0.14	0.03	0.03	0.05
Watershed Land Use											
Developed	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Forested/Scrubland	41%	39%	39%	13%	11%	27%	26%	32%	58%	17%	67%
Agriculture/Managed	59%	61%	61%	87%	89%	73%	74%	68%	42%	83%	32%
Open Water	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Watershed Impervious	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%	<1%

4.1 *Watershed Historical Land Use and Development Trends*

The Little Pine Creek III watershed is located in the rural countryside approximately 8 miles east of the Town of Sparta. Land use within the Little Pine Creek III watershed is historically rural and dominated by agriculture and forest and is approximately 58% managed herbaceous cover, 39% forested, and 3% cultivated land.

A review of historical aerials from 1964, 1976, 1982, 1988, 1995-1996, 1998, 2005, 2006, and 2008 verified that land use on the project site and in the watershed has remained relatively consistent for the past 50 years (historic aerial photos are included in Appendix 5).

There are no signs of impending land use changes or development pressure evident in the Little Pine watershed. Mr. Travis Dalton, the Alleghany County Planner, reviewed the site and watershed conditions during a telephone interview and confirmed that the historic agricultural and timber production land uses in the watershed are expected to continue for the foreseeable future with no indications of land use shifts. No transportation projects or major roadway improvements are planned for the area (Dalton, 2012). The Conservation Easement will eliminate potential for future development or agricultural use in the immediate riparian zone of the onsite streams.

4.2 *Watershed Assessment*

On June 15, 2012, Wildlands conducted a watershed reconnaissance visit to verify current land uses observed from the aerial photography and to identify potential stressors.

Consistent with information depicted in aerial photography, land use within the Little Pine Creek watershed is predominantly timber and agricultural production. Large disturbed areas within the watershed consist of large (several acre) fields with recent farm waste applications or recent tillage for new crop installation. A few single-family homes have been built in the past 5 years, but there is no evidence of significant new development. No areas of widespread floodplain or overland erosion were noted within the watersheds. Stream banks throughout the watershed are eroded and appear to be the primary source of fine grain sediment to the downstream reaches.

The project watershed perimeter closely follows Glade Valley Road, Big Oak Road, and Barrett Road, as shown in Figure 2. Topography can be described as somewhat hilly to gently rolling. There are no impoundments that significantly affect hydrology or sediment transport in the project watershed. Culverts at various road crossings throughout the watershed influence sediment transport at isolated locations. Channel substrate ranges from cobble to fines.

The USEPA's STEPL pollutant loading watershed model was used to estimate sediment load from the Little Pine Creek watershed. The model uses the revised Universal Soil Loss Equation, rainfall data for the county, watershed stream conditions, and land use data to estimate sediment load from the watershed. The model estimates that the watershed supplies 4,575 tons of sediment per year due to streambank erosion throughout the watershed.

4.3 Physiography, Geology, and Soils

The Project is located in the Blue Ridge Belt of the Blue Ridge Physiographic Province. The Blue Ridge Province is a deeply dissected mountain area where steep ridges, intermontane basins, and trench valleys intersect at various angles to create rugged terrain. The Blue Ridge Belt is composed of a complex mixture of igneous, sedimentary, and metamorphic rocks that are over one billion to about one-half billion years old. This complex has been repeatedly squeezed, fractured, faulted, and folded. The Blue Ridge Belt is known for its deposits of feldspar, mica, and quartz-basic materials used in the ceramic, paint and electronic industries (NCGS, 2009). Specifically, the proposed restoration site is located in the Zabg map identifier of the Blue Ridge Belt. This region is part of the Alligator Back Formation and is described as finely laminated to thin layered gneiss with massive gneiss and micaceous granule conglomerate locally contained. Schist, phylite, and amphibolites are included in this region (NCGS, 1985).

Soil mapping units are based on the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey for Alleghany County. Soil types within the study area include Alluvial land, wet (Ad), Ashe stony fine sandy loam (AsF), Chester clay loam (ChF2), Chester loam (CeE), Codorus complex (Cx), Gullied land (Gu), Tate loam (TaC), and Watauga loam (WaE and WaF). These soils are described below in Table 3. A soils map is provided in Figure 5.

Table 3. Floodplain Soil Types and Descriptions
Little Pine Creek III Stream & Wetland Restoration

Soil Name	Location	Description
Alluvial land, wet	Along Little Pine	Alluvial land, wet soils are found in depressions near floodplains. They are nearly level and very poorly drained. They are frequently flooded and occasionally ponded. The parent material is a loamy alluvium over sandy and gravelly alluvium. On NRCS National List for Alleghany County hydric soils.
Ashe stony fine sandy loam	Along UT2A upstream of its confluence with UT2, extending approximately 100 LF into the wooded area and continuing approximately 300 LF into the open field.	Ashe stony fine sandy loams are found on mountain slopes and ridges. The slopes range from 15 to 45 percent. They are not frequently flooded and are considered somewhat excessively drained. Depth to a restrictive feature (bedrock) is generally 20 to 40 inches.
Chester clay loam	In the right floodplain of UT2 near the upstream extent.	Chester soils are found on mountain slopes and ridges. The slopes range from 10 to 45 percent. They are not frequently flooded and are considered well drained. Depth to a restrictive feature (bedrock) is generally more than 80 inches.
Chester loam	Along upstream and downstream UT2-1, along the wooded section of UT2A, in the headwaters of UT2B, along UT3, along a portion of Little Pine in the right floodplain, and along the upstream extents of UT1.	
Codorus complex	Along Little Pine, along UT1, along lower UT2, and along the downstream portions of UT2A and UT2B.	Codorus soils are found on floodplains. They are nearly level and somewhat poorly drained. They are frequently flooded. The parent material is loamy alluvium derived from igneous and metamorphic rock. On NRCS National List for Alleghany County hydric soils.
Gullied land	Along a short, 100 LF section of the right floodplain of the upstream reach of UT2.	Gullied land soils are derived from creep deposits over residuum weathered from mica schist and/or gneiss and/or micaceous metamorphic rock.
Tate loam	Along the left floodplain of Little Pine beginning at the upstream project boundary.	Tate soils are found on fans, benches, and stream terraces. The slopes range from 6 to 10 percent. They are not frequently flooded and are considered well drained. Depth to a restrictive feature is generally more than 80 inches.
Watauga loam	Along UT4 and along Little Pine.	Watauga soils are found on mountain slopes and ridges. The slopes range from 6 to 45 percent. They are not frequently flooded and are considered well drained. Depth to a restrictive feature is generally more than 80 inches.

4.4 Valley Classification

The Project contains several different valley types. Little Pine Creek flows through a broad, flat, alluvial valley with gentle elevation relief. UT2, UT2A, UT2B, UT3, and UT4 all begin in steep, narrow, colluvial valleys. As UT2, UT2A, and UT2B come together, the valley widens and becomes alluvial and the elevation relief is gentle. UT1 flows through a steeper valley that transitions quickly into the alluvial floodplain of Little Pine. The surrounding fluvial and morphological landforms do not fit neatly into any valley type according to the Rosgen classification system (Rosgen, 1996); therefore the valley was not classified according to that system.

4.5 Surface Water Classification and Water Quality

On May 10, 2012, and January 21, 2013, Wildlands investigated on-site jurisdictional waters of the U.S. using the U.S. Army Corps of Engineers (USACE) Routine On-Site Determination Method. This method is defined in the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. Determination methods included stream classification utilizing the NCDWQ Stream Identification Form and the USACE Stream Quality Assessment Worksheet. Potential jurisdictional wetland areas as well as typical upland areas were classified using the USACE Wetland Determination Data Form.

The results of the on-site field investigation indicate that there are seven jurisdictional stream channels located within the proposed project area including Little Pine Creek and six unnamed tributaries (UT1, UT2, UT2A, UT2B, UT3, and UT4) to Little Pine Creek. Nine jurisdictional wetland areas were identified within the proposed project area (Wetlands AA, BB, CC, DD, EE, FF, GG, HH, and JJ) and are located within the floodplains of Little Pine Creek, UT2, UT2B, and UT4. Figure 7 provides an overview of the site assessment data points. Wetland Determination Data Forms representative of on-site jurisdictional wetlands as well as non-jurisdictional upland areas have been enclosed in Appendix 2 (DP1-DP10). Stream classification forms representative of on-site jurisdictional stream channels have been enclosed in Appendix 3 (SCP1-SCP9). Site photographs are included in Appendix 1, taken at locations as indicated in Figure 7.

The North Carolina Division of Water Quality (NCDWQ) assigns best usage classifications to State Waters that reflect water quality conditions and potential resource usage. Little Pine Creek (NCDWQ Index No. 10-9-10-5) is the main tributary of the project and has been classified as Class C waters. Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture, and other uses. Little Pine Creek also has a supplemental classification as Trout Waters (Tr). Trout waters are protected to sustain and allow for trout propagation and survival and include tributaries to stocked trout streams. Trout are not currently stocked in Little Pine Creek. Brush Creek, which is located downstream of the project site, is Hatchery Supported.

5.0 Baseline Information – Reach Summary

On-site existing conditions assessments were conducted by Wildlands between April and July 2012. The locations of the project reaches and surveyed cross sections are shown in Figure 3. Existing geomorphic survey data is included in Appendix 6. Table 4 presents the reach summary information.

Table 4. Reach Summary Information
Little Pine Creek III Stream & Wetland Restoration Project

	LP1	LP2A	LP2B	UT1	UT2	UT2	UT2	UT2A	UT2B	UT3	UT4
Restored Length (LF)[1]	1,350	1,025	969	892	4,447			2,888	541	384	1,036
Valley Type	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]	N/A[2]
Valley Slope (feet/ foot)	0.0043	0.0059	0.0087	N/A[3]	0.047	0.036	0.028	0.044	0.064	N/A[3]	N/A[3]
Drainage Area (acres)	2,496	2,752	2,784	28	75	185	196	89	19	23	33
Drainage Area (miles^2)	3.7	4.0	4.1	0.04	0.11	0.27	0.29	0.13	0.03	0.03	0.05
NCDWQ Stream ID Score	45.5	45.5	45.5	22.25	36	36	41.5	42	28/37.5	38.5	31.5
Perennial or Intermittent	P	P	P	I	P	P	P	P	I/P	P	P
NCDWQ Classification	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr	C, Tr
Rosgen Classification	C4	C/E4	C4	N/A[3]	A4	E4b	E4	C4b	F4b	N/A[3]	N/A[3]
Simon Evolutionary Stage	IV/V	III/IV	IV/V	N/A[3]	N/A[5]	N/A[5]	N/A[5]	V	N/A[5]	N/A[3]	N/A[3]
FEMA zone Classification	X	X	AE[4], X	X	X	X	X	X	X	X	X

1: Restored length includes only streams within the conservation easement and excludes constructed ford and culvert crossing lengths within the easement.

2: Valley descriptions included in previous text. Rosgen valley type classification not applicable.

3: UT1 is proposed for enhancement II only, and UT3 and UT4 are proposed for preservation only. Geomorphic surveys were not performed for these streams.

4: The downstream 400 LF of Little Pine Creek near Big Oak Road is within a FEMA Zone AE floodplain on Firm panel 4010. The Zone AE floodplain is due to the backwater of Brush Creek; Little Pine Creek is not a FEMA-studied stream.

5: Streams do not fit into Simon Evolutionary Sequence.

5.1 Existing Stream and Vegetation Condition

The streams located throughout the project site flow through a mix of pastures used for grazing livestock and forested areas. The livestock have full access to most of the onsite streams and use them as a watering source. Vegetation has been maintained in pasture along the majority of Little Pine Creek, UT1, UT2 Reach 2 and Reach 3, and the most upstream and downstream reaches of UT2A. The riparian buffers on these reaches are primarily herbaceous with a few sparse trees. Pasture grasses such as fescue (*Festuca* sp.) are the dominant ground cover in these reaches. Species that make up the sparse tree layer include American sycamore (*Platanus occidentalis*), black willow (*Salix nigra*), red maple (*Acer rubrum*), and sweetgum (*Liquidambar styraciflua*). These streams largely exhibit impact from vegetation management and cattle access in the form of lateral erosion.

A short upstream length of Little Pine Reach 1, UT2 Reach 1, the middle reach of UT2A, UT2B, UT3, and downstream end of UT4 flow through early to mid-successional forests. Dominant canopy species within these areas include American sycamore, red maple, southern red oak (*Quercus falcata*), sweetgum, and tulip poplar (*Liriodendron tulipifera*). The upstream third of UT4 is a steep narrow valley. The canopy species in this area are similar to those already stated however the understory layer is dominated by rhododendron (*Rhododendren* sp.). These reaches are varied in their condition, ranging from full lateral instability on the upstream reach of Little Pine to isolated areas of vertical and/or lateral instability on UT2 Reach 1, UT2A, and UT2B to full stability on portions of UT2A, UT3, and UT4.

A small area of planted white pine (*Pinus strobus*) and loblolly pine (*Pinus taeda*) is located along the left valley near the upstream end of Little Pine Creek Reach 1 and lower half of UT4.

5.2 Stream Geomorphology

Overall, the Project streams are impaired due to livestock access, channelization, and agricultural activities; therefore, bankfull features were occasionally present but inconsistent. An estimate of existing bankfull discharge was made for each reach by correlating observed bankfull features with estimates of bankfull discharge from regional curve and reference reach datasets. Wildlands completed a Level II morphological description per the Rosgen stream classification system based on the bankfull stage estimated from field identified bankfull features and the bankfull discharge estimates. Existing geomorphic conditions for each project reach are summarized below in Tables 5a -5c and the reaches are mapped on Figure 3.

5.2.1 Little Pine Creek

Little Pine Creek Reach 1 is located within the upstream area of the project and drains 3.9 square miles. The upper portion of the reach flows through a narrow, partially wooded buffer. The lower portion of the reach is located in a broad pasture. The reach is relatively straight and exhibits extensive stream bank erosion. Channel widening is evident. Depositional sands and fine sediments are evident throughout the reach with side, transverse, and mid channel bars forming. The severity of the bank erosion and channel adjustment processes increases from upstream to downstream, especially as the riparian corridor transitions from partially wooded to pasture.

Little Pine Creek Reach 1 has a width to depth ratio ranging from 14.3 to 23.9, an entrenchment ratio greater than 2.2, and an average slope of approximately 0.5%. The reachwide d_{50} is 10.2 mm. The stream classifies as a Rosgen C4 stream type. The bank height ratio ranges from 1.2 – 1.4 and is highly variable throughout the reach with an observable trend of a tall steep eroded bank on one side and a lower bank on the opposite side above the approximated bankfull stage. Therefore, the reach is moderately incised but still highly erosive with inconsistent floodplain access. Riffle – pool sequences are not abundant and much of the bed substrate is impacted by fine sediments.

Little Pine Reach 2A wanders across a broad pastured valley in an irregular pattern. This reach drains 4.3 square miles. The reach is characterized by lateral bank erosion, steep vertical banks, and an alternating pattern of narrower and overwidened stream sections. There is strong evidence of laterally unstable meander development. Cattle have direct access to the stream: bank trampling and hoof shear are evident throughout the reach.

The channel has a width to depth ratio of 11.6 at the surveyed cross section but a much higher width depth ratio was apparent in various locations. The entrenchment ratio is greater than 2.2, and the average slope is slightly less than 0.5%. The reachwide d_{50} is 1.3 mm. The bed appears to be bimodal with both a large sand and gravel component. The channel classifies as a C/E5 stream type.

The bank height ratio varies throughout Little Pine Reach 2A and is 1.6 at the surveyed cross section. A general trend was observed of more incised and narrow straight sections verses less incised and overwidened sections where lateral migration was apparent. The stream is highly erosive as evidenced by lateral bend migration and steep, eroding stream banks. Riffle – pool sequences are not abundant and much of the bed substrate is impacted by fine sediments.

Little Pine Reach 2B flows through a narrow valley used for pasture and ends at the culvert under Big Oak Road. This reach drains 4.4 square miles. The reach is very straight and located along the left valley wall especially in the downstream portion of the reach. Cattle have direct access to the stream: bank trampling and hoof shear are evident throughout the reach. There are segments of vertical, eroding stream banks on both banks but this is less prevalent than in Reaches 1 and 2A. The stream is generally over-widened and relatively closely connected to the floodplain elevation but lacks riffle – pool bed morphology.

The channel has a width to depth ratio of 16.1 at the surveyed cross section. The entrenchment ratio is greater than 2.2, and the average slope is approximately 0.5%. The reachwide d_{50} is 18.4 mm. The channel classifies as a straightened C4 stream type. The bank height ratio at the surveyed cross section is 1.0.

Table 5a. Existing Stream Conditions – Little Pine Creek
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	Little Pine Reach 1		Little Pine Reach 2A		Little Pine Reach 2B	
			Min	Max	Min	Max	Min	Max
stream type			C4		E/C5		C4	
drainage area	DA	sq mi	3.9		4.3		4.4	
bankfull cross-sectional area	A_{bkf}	SF	45.5	47.5	53.3		53.0	
average velocity during	v_{bkf}	fps	4.2	4.6	4.0		4.4	
width at bankfull	w_{bkf}	feet	25.8	33.4	24.9		29.0	
maximum depth at bankfull	d_{max}	feet	3.3	3.3	3.7		2.2	
mean depth at bankfull	d_{bkf}	feet	1.4	1.8	2.1		1.8	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		14.3	23.9	11.6		16.1	
low bank height		feet	3.8	4.6	5.8		2.2	
bank height ratio	BHR		1.2	1.4	1.6		1.0	
floodprone area width	w_{fpa}	feet	>200	>200	>200		>200	
entrenchment ratio	ER		>2.2	>2.2	>2.2		>2.2	
valley slope	S_{valley}	feet/ foot	0.0057		0.0087		0.0089	
channel slope[1]	$S_{channel}$	feet/ foot	0.0048/0.0058		0.0033/0.0057		0.0049/0.0058	
riffle slope	S_{riffle}	feet/ foot	0.012	0.019	0.0095	0.031	0.028	0.045
riffle slope ratio	$S_{riffle}/S_{channel}$		2.1	3.3	2.9	9.3	5.8	9.1
pool slope	S_{pool}	feet/ foot	0.0004	0.0106	0.000	0.002	0.000	0.002
pool slope ratio	$S_{pool}/S_{channel}$		0.1	2.2	0.0	0.6	0.0	0.5
pool-to-pool spacing	L_{p-p}	feet	38	85	55	227	65	229
pool spacing ratio	L_{p-p}/w_{bkf}		1.5	3.3	2.2	9.1	2.2	7.9
sinuosity	K		1.2		1.7		1.1	
belt width	w_{blt}	feet	63	82	77	94	57	
meander width ratio	w_{blt}/w_{bkf}		2.4	2.5	3.1	3.8	2.0	
meander length	L_m	feet	86	140	110	186	100	134
meander length ratio	L_m/w_{bkf}		3.3	4.2	4.4	7.5	3.4	4.6
radius of curvature	R_c	feet	25	59	39	58	34	70
radius of curvature ratio	R_c/ w_{bkf}		1.0	1.8	1.6	2.3	1.2	2.4
Particle Size Distribution from Reachwide Pebble Count								
d_{50} Description			Medium Gravel		Very Coarse		Coarse Gravel	
	d_{16}	mm	Silt/Clay		Silt/Clay		Silt/Clay	
	d_{35}	mm	4.5		0.4		0.5	
	d_{50}	mm	10.2		1.3		18.4	
	d_{84}	mm	61.2		77.8		79.2	
	d_{95}	mm	143.4		180.0		143.4	
	d_{100}	mm	>2048		362.0		256.0	

1 Channel slopes are specific to the length of profile studied

5.2.2 UT1

UT1 is an intermittent tributary to Little Pine Creek Reach 2A with a 0.04 square mile drainage area. The reach drains north to south. The upper portion of the reach is steep and flows within a narrow valley wooded with planted pines. The lower portion is in gently sloped pasture and flows through Wetland FF before joining Little Pine Creek. No detailed geomorphic measurements were collected along UT1.

5.2.3 UT2

UT2 is a perennial stream that drains the north portion of the project area and is a tributary to Little Pine Creek Reach 2A. UT2 Reach 1 begins as a single thread channel through a colluvial valley at the upstream project boundary. This reach is steep; slope ranges from 4% to 6%. UT2 Reach 1 drains a 0.12 square mile watershed. Woody vegetation along the reach consists of a narrow buffer of sparse, mixed hardwood species with little understory vegetation due to cattle grazing. Approximately 100 feet downstream from the project boundary, the colluvial valley walls widen and a narrow, alluvial valley bottom is present. Here UT2 Reach 1 begins to anastomose as it enters Wetland BB. UT2 Reach 1 regains single thread morphology just downstream of the wetland and a small headcut has formed. Approximately 100 LF further downstream, UT2 becomes incised and exhibits several small headcuts downstream as the incision worsens. UT2 regains connection to the narrow alluvial floodplain as it enters Wetland AA where it again becomes anastomosed. UT2 regains single thread morphology downstream of Wetland AA and exhibits isolated areas of bank erosion as it approaches a culvert farm road crossing.

Downstream of the culvert outlet, UT2 Reach 1 is incised and scoured; however, it regains connection to the floodplain approximately 200 LF downstream. Here, the valley walls begin to pinch in and the riparian buffer becomes denser with mixed hardwood species. UT2 Reach 1 continues in a stable, riffle-run morphology with a few isolated areas of bank erosion for another 200 LF. The valley walls pinch closer and the stream bed morphology becomes dominated by bedrock slides and stable riffle/run and step pool morphology. UT2 Reach 1 continues in this condition until approximately 500 feet upstream of its confluence with UT2B where the valley begins to widen slightly. Here, a large headcut is present and UT2 Reach 1 becomes incised, exhibiting shear banks and an unstable channel bottom until its confluence with UT2B. The reach break between UT2 Reach 1 and UT2 Reach 2 is located at the UT2B confluence. A relic channel is present in the left floodplain of UT2 from the headcut to the reach break which suggests that UT2 was once stable and connected to a narrow floodplain in this location.

UT2 Reach 1 classifies as a Rosgen A4 stream channel due to a low to moderate entrenchment ratio (1.1 to 3.1), high slopes (4% to 6%), and a low bankfull width to depth ratio ranging from 4.1 to 11.0. Although the pebble count indicates that UT2 Reach 1 transports gravels, the bed morphology is influenced by larger cobble-sized particles contributed from hillslope processes as well as bedrock outcrops.

Downstream of the confluence with UT2B, UT2 Reach 2's valley widens and the slope decreases. The drainage area is 0.29 square miles at the end of the reach. UT2 Reach 2's riparian buffer is predominately maintained, herbaceous pasture. The stream exhibits riffle/pool complexes and stable, herbaceous bank vegetation. UT2 Reach 2 is joined by UT2A approximately halfway through the reach. A farm ford crossing is located just upstream of this confluence and isolated areas of bank erosion are present both upstream and downstream of the crossing. Wetland DD is located just north of the UT2 Reach 2 and UT2A confluence. Approximately 200 LF downstream of the UT2A confluence, the valley slope decreases again and UT2 begins to gain pattern. Wetland

EE is present in the left floodplain. This valley and stream geomorphology change marks the break between UT2 Reach 2 and Reach 3.

UT2 Reach 2 classifies as a Rosgen E4b stream channel due to a high entrenchment ratio (8.1), a low bankfull width to depth ratio of 4.2, and a slope higher than typically seen in an E-type channel (2.9%). UT2 Reach 2 is dominated by medium gravel sized particles.

UT2 Reach 3 transitions from the higher sloped valley typical of the stream to a flatter alluvial valley on the floodplain of Little Pine Creek. The drainage area is 0.31 square miles at UT2 Reach 3’s confluence with Little Pine Creek. The riparian buffer is primarily maintained pasture grasses with a few sparse trees near the upstream boundary. UT2 Reach 3 gains tortuous meander geometry and exhibits shear, eroding banks throughout the reach. The reach has a sinuosity of 2.1 and a meander width ratio of 17, indicating how broadly this reach meanders across the floodplain. Riffles were observed in meander bends which can be a symptom of downward valley migration. The banks lack stabilizing vegetation. A farm ford crossing is located near the middle of this reach. Where UT2 Reach 3 joins Little Pine Creek, there is a large depositional feature composed of sands and gravels.

UT2 Reach 3 classifies as a Rosgen E4 stream channel due to a high entrenchment ratio (5.9), a low bankfull width to depth ratio (5.7), and high sinuosity (2.1). The bank height ratio is 1.2, which indicates that UT2 Reach 3 is slightly incised and disconnected from the active floodplain at bankfull flows even though it is not entrenched. Although some incision is expected on this reach as it cuts down to meet the grade of the larger stream system, this measurement was taken upstream of what was believed to be the backwater effects of Little Pine. UT2 Reach 3 is dominated by medium gravel sized particles.

Existing geomorphic conditions for UT2 Reach 1, 2, and 3 are summarized below in Table 5b and the reaches are mapped on Figure 3.

Table 5b. Existing Stream Conditions – UT2
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	UT2		UT2		UT2	
			Min	Max	Min	Max	Min	Max
stream type			A4		E4b		E4	
drainage area	DA	sq mi	0.12		0.29		0.31	
bankfull cross-sectional area	A_{bkf}	SF	5.9	8.6	8.7		8.5	
average velocity during	v_{bkf}	fps	2.3	3.4	4.0		4.1	
width at bankfull	w_{bkf}	feet	4.9	9.7	6.1		7.0	
maximum depth at bankfull	d_{max}	feet	1.4		2.3		1.9	
mean depth at bankfull	d_{bkf}	feet	0.9	1.2	1.4		1.2	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		4.1	11.0	4.2		5.7	
low bank height		feet	3.6	4.5	2.3		2.2	
bank height ratio	BHR		2.6	3.2	1.0		1.2	
floodprone area width	w_{fpa}	feet	5.4	29.9	49.3		41.0	
entrenchment ratio	ER		1.1	3.1	8.1		5.9	
valley slope[1]	S_{valley}	feet/ foot	0.0476		0.0363		0.0280	
channel slope[1]	$S_{channel}$	feet/ foot	0.0436		0.0290		0.0163	
riffle slope	S_{riffle}	feet/ foot	0.012	0.083	0.0327	0.063	0.0092	0.068
riffle slope ratio	$S_{riffle}/S_{channel}$		0.3	1.9	1.1	2.2	0.6	4.2
pool slope	S_{pool}	feet/ foot	0.0	0.0342	0.0	0.023	0.001	0.006
pool slope ratio	$S_{pool}/S_{channel}$		0.0	0.7	0.0	0.8	0.1	0.4
pool-to-pool spacing	L_{p-p}	feet	11.6	40.5	14.0	68.0	22.0	63.0
pool spacing ratio[2]	L_{p-p}/w_{bkf}		1.6	5.5	2.3	11.1	3.1	9.0
sinuosity	K		1.1		1.3		2.1	
belt width	w_{blt}	feet	N/A	N/A	49	52	120	
meander width ratio	w_{blt}/w_{bkf}		N/A	N/A	8.0	8.5	17.1	
meander length	L_m	feet	N/A	N/A	64	188	43	141
meander length ratio	L_m/w_{bkf}		N/A	N/A	10.5	30.8	6.1	20.1
radius of curvature	R_c	feet	N/A	N/A	10	48	8	27
radius of curvature ratio	R_c/ w_{bkf}		N/A	N/A	1.6	7.9	1.1	3.9
Particle Size Distribution from Reachwide Pebble Count								
d_{50} Description			Medium Gravel		Medium		Medium Gravel	
	d_{16}	mm	Silt/Clay		Silt/Clay		Silt/Clay	
	d_{35}	mm	5.9		8.0		8.0	
	d_{50}	mm	10.7		15.0		15.0	
	d_{84}	mm	21.5		55.6		55.6	
	d_{95}	mm	36.7		84.6		84.6	
	d_{100}	mm	90.0		180.0		180.0	
1 Valley and channel slopes are specific to the length of profile studied								

5.2.4 UT2A

UT2A drains the northwest portion of the project area with a drainage area of approximately 0.14 square miles. UT2A begins at a springhead in a steep, colluvial valley just upstream of the project area and is classified as a perennial relatively permanent water (RPW) along its entire length. The upstream most section of UT2A is accessed by cattle. Within the headwaters, the stream banks are severely trampled and lack stabilizing riparian vegetation. Multiple areas along the reach are impacted by down trees, limbs, and other material that has been pushed into the channel from adjacent hillside clearing activities. Several headcuts are present along this portion of the stream channel including a large bedrock knick point. UT2A continues into a mature forest which has been fenced off from livestock. Within this reach, UT2A exhibits well-defined riffle-pool sequences, stable channel banks, depositional bars and benches, and grade control from large cobble substrate contributed from hillslope processes. This section of UT2A is considered a reference condition, representing the morphologically stable potential of many of the project reaches. As UT2A approaches its confluence with UT2, the valley slope becomes gentler and the riparian area transitions to maintained pasture. Despite cattle impacts, this stream remains well connected to the floodplain and exhibits riffle-pool complexes. Towards the confluence, UT2A is confined along the right valley wall, and exhibits some erosion in the outside of meander bends.

In order to classify the degraded portion of the stream, a geomorphic assessment of UT2A was conducted within the active cattle pasture. UT2A classifies as a Rosgen C4b stream channel due to a high entrenchment ratio (4.6), a high bankfull width to depth ratio (19.3), and high sinuosity (1.3) with a channel slope higher than observed in typical C-type channels (3.4%). UT2A is dominated by medium gravel-sized particles. A separate geomorphic assessment of the reference condition portion of UT2A was also conducted and is described in Section 8 of this report.

Existing geomorphic conditions for the degraded portion of UT2A are summarized below in Table 5c and the reach is mapped on Figure 3.

5.2.5 UT2B

UT2B drains the northeast portion of the project area and has a watershed area of approximately 0.03 square miles. UT2B begins in a relatively steep valley as a long ephemeral drainage and quickly transitions to an intermittent RPW immediately upstream of Wetland CC. This transition occurs at a small headcut, at which point the channel exhibits a defined bed and bank, substrate sorting, and indications of intermittent baseflow conditions. As UT2B reaches its confluence with Wetland CC, the channel receives increased hydrology from a groundwater seep and becomes perennial. The stream is well connected to the floodplain with defined bed and banks, alluvial deposits, and established riffles. Tree roots extending across the channel have protected this upstream section of UT2B from a large 6-foot head cut. Downstream from these tree roots, UT2B is deeply incised and exhibits multiple additional headcuts prior to reaching UT2.

In order to classify the degraded portion of the stream, a geomorphic assessment of UT2B was conducted downstream of the 6-foot head cut. UT2B classifies as a Rosgen F4b stream channel due to a low entrenchment ratio (1.3), low sinuosity (1.1), and a high bankfull width to depth ratio (22.6). The 'b' of F4b relates to the 4% channel slope, which is higher than typically seen on F-type streams. UT2B is also deeply incised as evidenced by a 5.8 bank height ratio. Stream substrate is dominated by medium to coarse gravels.

Existing geomorphic conditions for the degraded portion of UT28 are summarized below in Table 5c and the reach is mapped on Figure 3.

Table 5c. Existing Stream Conditions – UT2A and UT2B
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	UT2A		UT2B	
			Min	Max	Min	Max
stream type			C4b		F4b	
drainage area	DA	sq mi	0.14		0.03	
bankfull cross-sectional area	A_{bkf}	SF	4.9		3.1	
average velocity during	v_{bkf}	fps	3.1		3.2	
width at bankfull	w_{bkf}	feet	9.7		8.3	
maximum depth at bankfull	d_{max}	feet	1.2		0.6	
mean depth at bankfull	d_{bkf}	feet	0.5		0.4	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		19.3		22.6	
low bank height		feet	1.2		3.5	
bank height ratio	BHR		1.0		5.8	
floodprone area width	w_{fpa}	feet	45.0		10.6	
entrenchment ratio	ER		4.6		1.3	
valley slope[1]	S_{valley}	feet/ foot	0.0490		0.0667	
channel slope[1]	$S_{channel}$	feet/ foot	0.0336		0.0406	
riffle slope	S_{riffle}	feet/ foot	0.0356	0.062	0.0178	0.081
riffle slope ratio	$S_{riffle}/S_{channel}$		1.1	1.8	0.3	1.4
pool slope	S_{pool}	feet/ foot	0.002	0.026	0.000	0.040
pool slope ratio	$S_{pool}/S_{channel}$		0.1	0.8	0.0	0.7
pool-to-pool spacing	L_{p-p}	feet	17	59	8	34
pool spacing ratio	L_{p-p}/w_{bkf}		1.8	6.1	1.0	4.1
sinuosity	K		1.3		1.1	
belt width	w_{blt}	feet	105		N/A	N/A
meander width ratio	w_{blt}/w_{bkf}		10.8		N/A	N/A
meander length	L_m	feet	63	152	N/A	N/A
meander length ratio	L_m/w_{bkf}		6.5	15.7	N/A	N/A
radius of curvature	R_c	feet	16	34	N/A	N/A
radius of curvature ratio	R_c/ w_{bkf}		1.6	3.5	N/A	N/A
Particle Size Distribution from Reachwide Pebble Count						
d_{50} Description			Medium Gravel		Med/Coarse	
	d_{16}	mm	Silt/Clay		Silt/Clay	
	d_{35}	mm	9.2		11.0	
	d_{50}	mm	12.8		16.0	
	d_{84}	mm	48.3		52.6	
	d_{95}	mm	75.9		128.0	
	d_{100}	mm	180.0		180.0	

[1] Valley and channel slope are specific to the length of profile studied

5.2.6 UT3

UT3 is a perennial tributary to UT2A. The stream originates offsite at the outlet of a pond and drains a watershed area of 0.04 square miles. Within the project limits, UT3 is located in a mature forest which has been fenced off from livestock. No geomorphic measurements were conducted on UT3 because the treatment will be preservation only.

5.2.7 UT4

UT4 is a perennial tributary which joins Little Pine Creek Reach 1 near the upstream project boundary. The stream has a 0.05 square mile drainage area and drains south to north through a mixed hardwood forest. UT4 flows through an old, breached pond approximately halfway down its length. The pond bottom supports Wetland JJ. UT4 flows along the property boundary below this pond feature and jogs across the boundary several times before joining Little Pine Creek. Wetland HH is located at the confluence of UT4 and Little Pine Creek. No geomorphic measurements were collected along UT4.

5.3 Channel Evolution

Channelization usually includes straightening and deepening of streams and is one of the major causes of channel down-cutting or incision (Simon, 1989; Simon and Rinaldi, 2006). Based on Simon's model termed the Channel Evolution Model (CEM) for Incised Rivers (1989), alluvial streams typically follow a sequential series of evolutionary stages as they respond and ultimately recover from impacts due to channelization or majors changes to hydrologic and sediment regime. Pre-disturbance is considered Stage I - Equilibrium. Stage II - Channelization occurs when the stream is either directly channelized by man through ditching or channelization occurs as an indirect result of hydrologic or sediment regime changes in the watershed. These actions take the stream out of equilibrium and alluvial channels will incise and degrade in response to the excess stream energy associated with Stage II. This incision process is Stage III - Degradation. As the bottom of the channel continues to erode and stream banks are undercut, the banks will begin to fail and the channel widens as it degrades. This next stage is classified as Stage IV – Degradation and Widening. Eventually, the stream slope will decrease enough that the stream stops incising but continues to widen through alternate bank erosion and aggradation (Stage V- Aggradation and Widening). At Stage V, new bankfull features begin to establish at a lower position relative to the old valley floor, and the stream continues to widen its new floodplain through alternate bank erosion until it eventually returns to a state of quasi-equilibrium (Stage VI). Lateral adjustment processes (migration) are often associated with Stages IV and V.

Although there is no direct evidence on historic aerial photos (which only date back to 1964), Little Pine Creek Reach 1 may have been historically straightened given its location closer to and at times against the left valley wall. The reach is impacted by livestock, especially in the lower half, and is best described by late Stage IV/ early Stage V of the CEM. It is likely that livestock alterations interrupt and prevent full recovery of the stream to a Stage VI equilibrium, leaving the stream in a constant cycle of disturbance and partial recovery.

Little Pine Creek Reach 2A does not exhibit classic signs of channelization, but is unstable and alternates between a narrower cross section with a degrading bed and a wider cross section with eroding banks. The reach could be described by late Stage III/ early Stage IV with some areas showing evidence of Stage V. The livestock play a role in the stream bank instability and it is likely that their continued disturbance prevents full recovery of the stream to a Stage VI equilibrium.

Little Pine Creek Reach 2B may have been historically straightened given its location against the left valley wall. The reach is impacted by livestock and best described by late Stage IV/ early Stage V. Like Little Pine Creek Reach 1 and Reach 2A, the livestock likely continue to destabilize the banks which prevent the stream from making a recovery to Stage VI.

No portion of Little Pine Creek has advanced through the evolutionary process to long term – self maintaining Stage VI where a new quasi-equilibrium can be expected. Continuous cattle impacts and many years of degradation and widening, contributing substantial sediment loading to downstream waters, are expected before these channels could achieve a new stable form on their own. Restoration has been selected as the appropriate treatment approach in order to establish a stable cross-section, pattern, and profile rather than stabilizing a poorly functioning channel in place. Restoration will re-connect the currently incised channels with an expansive floodplain for energy dissipation.

UT1, UT2 Reach 1 and Reach 2, UT3, and UT4 do not appear to be actively adjusting in a manner described by the Channel Evolution Model. The downstream reach of UT2A may have been historically straightened given its location against the right valley wall near its confluence with UT2. If so, the stream appears to have reestablished a floodplain. Some lateral migration is evident in the form of bank erosion. This reach may be described as late Stage V.

UT2B and UT2 Reach 3 do not appear to be actively adjusting in a manner described by the Channel Evolution Model, however, they do appear to be adjusting to the removal of stabilizing bank vegetation. UT2B has adjusted by vertically incising, while UT2 Reach 3 is laterally eroding.

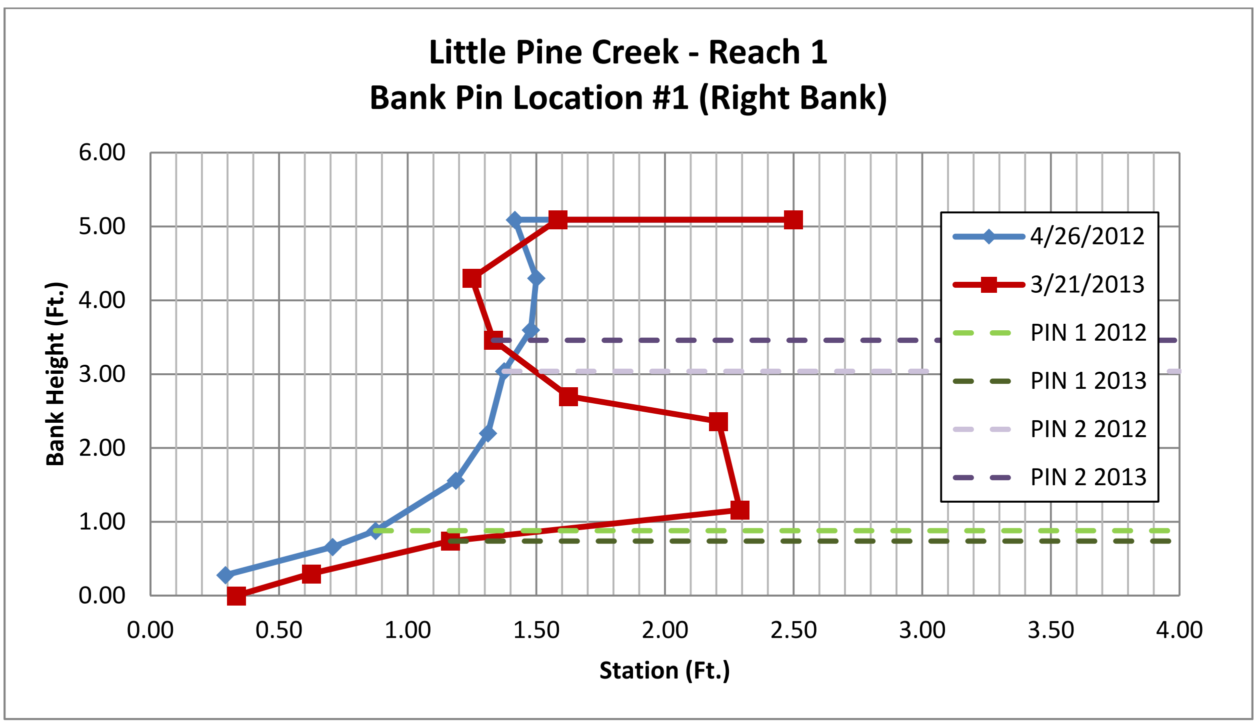
5.4 Channel Stability Assessment

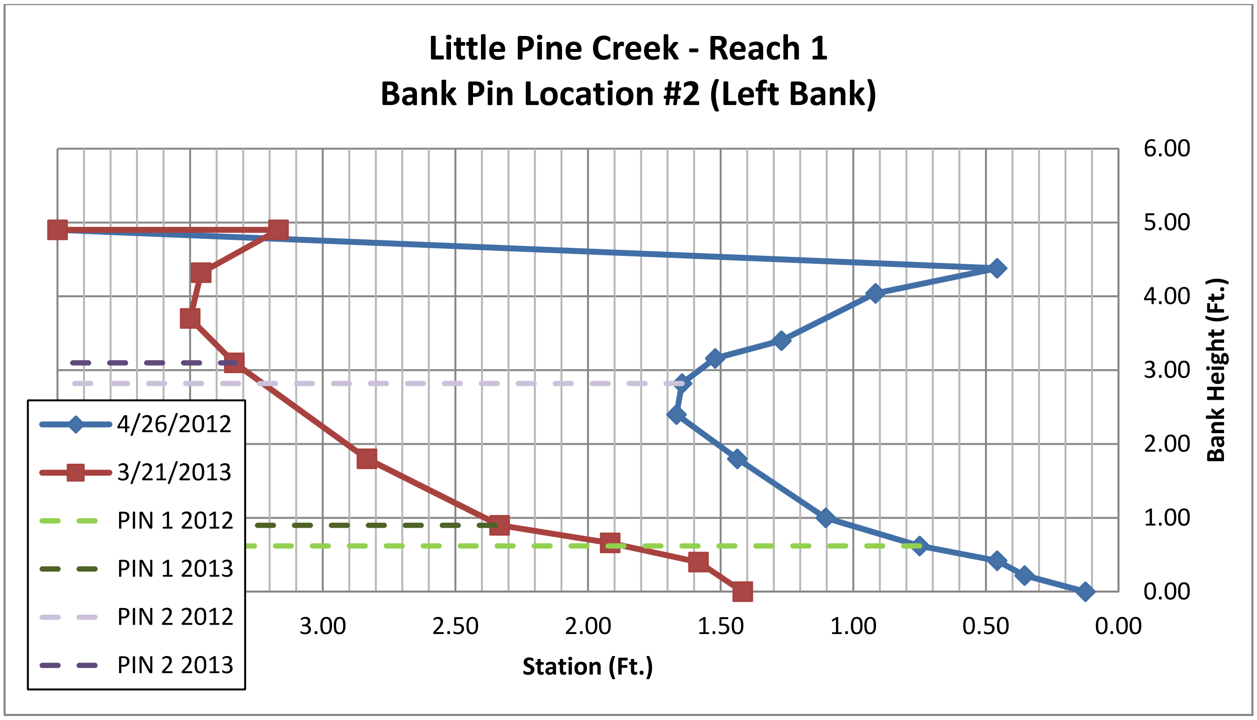
Wildlands utilized bank erosion pins and bank profiles to determine a rate of linear retreat and estimate lost volume of sediment due to stream bank erosion on Little Pine Creek and UT2 Reach 3. The method monitors changes in the shape of the channel through establishing several standardized measurement locations marked by embedded metal rods. Through repeated measurement a greater length of pin is exposed from which lateral of retreat can be calculated. Repeated measurement of bank profiles using toe pins at these locations provides a rate of sediment loss by area, which can be used to determine the lateral erosion rate and sediment yield. Measuring bank profiles in concert with bank pins enhances both the accuracy and precision of erosion measurements. The assessment results for streams at Little Pine Creek III indicate that stream bank erosion and lateral migration is occurring at outside meander bends. Table 6 shows a summary of bank pin and bank profile data.

Table 6. Bank Pin Data
Little Pine Creek III Stream & Wetland Restoration Project

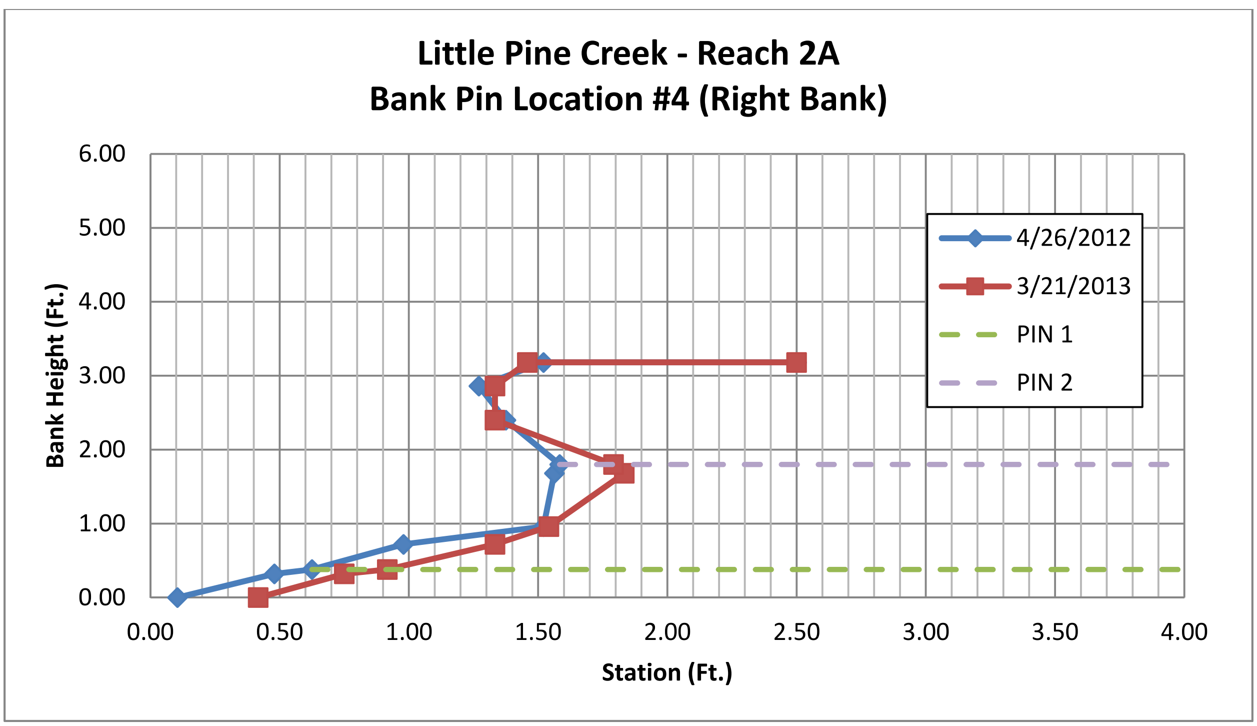
Reach	Site #	2012-2013 Sediment Lost (ft^3/LF/yr)[A]	PIN #	LF retreat/year	AVG LF retreat/year
Little Pine Creek Reach 1 (right bank)	1	2.12	1	0.32	0.14
			2	-0.05	
Little Pine Creek Reach 1 (left bank)	2	8.66	1	1.76	1.81
			2	1.87	
Little Pine Creek Reach 2A (right bank)	4	0.50	1	0.32	0.28
			2	0.23	
Little Pine Creek Reach 2B (right bank)	5	0.55	1	0.12	0.09
			2	0.07	
UT2 Reach 3 (right bank)	3	1.52	1	0.02	0.32
			2	0.62	
A: Surveys taken on April 27, 2012 and March 21, 2013.					

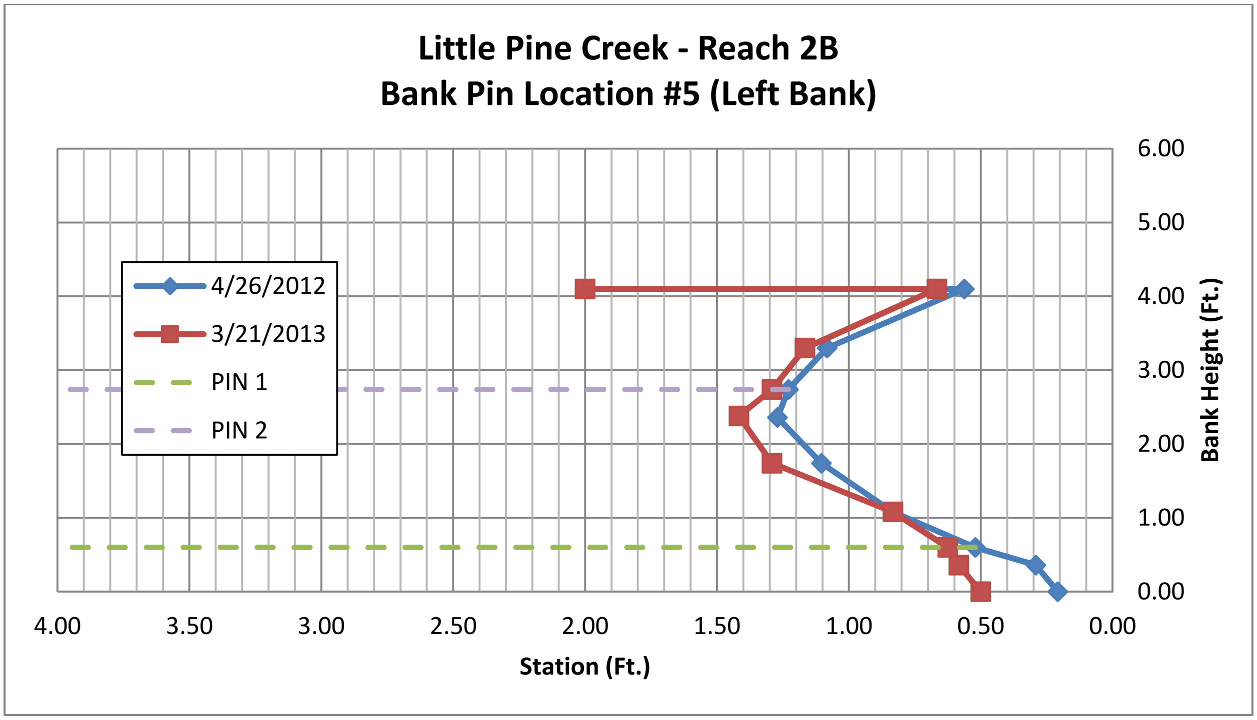
Bank pin data measured at both the left and right banks of Little Pine Creek Reach 1 showed severe lateral migration and changes in channel dimensions, with the left bank retreating at 1.81 ft/yr and the right bank retreating at 0.14 ft/yr. Bank profiles show sediment loss of up to 8.66 ft^3 per linear foot of stream bank per year (ft^3/LF/yr) on the left bank, and 2.12 ft^3/LF/yr on the right bank. The bank profile on the right bank shows this area becoming extremely undercut, so sediment losses of greater proportions could be expected at this location.



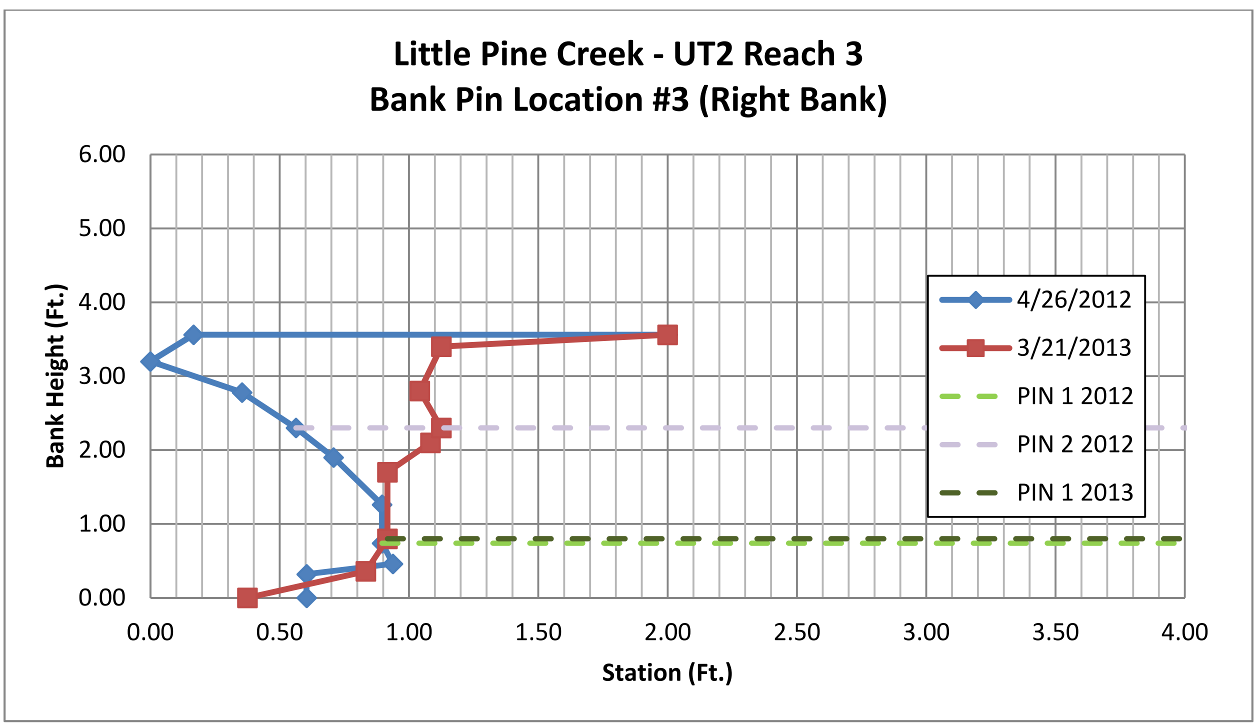


Little Pine Creek Reach 2A shows lateral migration on the right bank of 0.28 ft/yr. The bank profile shows 0.5 ft^3/LF/yr of lost sediment. Similar results were found at Little Pine Creek Reach 2B, with bank profile showing 0.55 ft^3/ft/yr of lost sediment, but bank pins showing only 0.09 ft/yr retreat on average. This is because a greater amount of erosion occurred between bank pins than at pin measurement locations.





UT2 Reach 3 has bank pin and profile data from the right bank, showing a major change in channel dimensions, where sediment from severely undercut banks is lost between 2012 and 2013. This is reflected by the linear retreat at PIN 1 (the upper pin) but not at PIN 2 (the lower pin). Average linear retreat at this location was 0.29 ft/yr, with bank profile data showing 1.37 ft^3/LF/yr of lost sediment.



5.5 Bankfull Verification

Bankfull stage indicators on the project streams were inconsistent due to channel evolution processes and livestock impacts. However, during the existing conditions assessment, Wildlands staff identified the best available bankfull indicators and surveyed cross sections at those locations. Bank features considered to be potential bankfull indicators included flat depositional features and prominent breaks in slope. Manning's equation was applied to the surveyed cross-sections to calculate an estimated bankfull discharge. The results are presented in Table 7.

Existing conditions bankfull discharge estimates were compared to drainage area discharge estimates from two reference reaches described in Section 8, the North Carolina Mountain Regional Curve (Harman et. al., 2000), and the regional flood frequency relationships developed for the Little River and Laurel Branch Local Watershed Plans (LWP) (NCEEP, 2005). The Little River and Laurel Branch LWP regional flood frequency curve was developed from analysis of three USGS gages in North Carolina and five USGS gages in southern Virginia. Section 4 of the LWP describes, in detail, the methodology and results. The analysis presented in the LWP shows that the regional flood frequency curve predicts lower discharge values per unit drainage area than other published regional curves applicable to the physiographic area. It should be noted that the study area for the LWP includes the project site and the references reaches selected for use in this project.

The results are presented in Figure 8.

Analysis of the bankfull discharge estimates for the Little Pine Creek reaches shows that the discharge – drainage area relationship falls below the North Carolina Mountain Curve and between the 1.2- and 1.8-year recurrence interval bands calculated from the Little River and Laurel Branch LWP regional flood frequency curve. This indicates that the drainage area – discharge relationship observed on Little Pine Creek is more similar to the relationship expressed in the Little River and Laurel Branch LWP regional flood frequency analyses than the relationship expressed in the North Carolina Mountain Curve. The discharge – drainage area data for one of the reference reaches selected for use in the project, Meadow Fork, also falls between the 1.2- and 1.8-year recurrence interval bands. Meadow Fork has a similar drainage area to the Little Pine project reaches. The fact that the reference reach exhibits a similar drainage area – discharge relationship to the drainage area – discharge relationships calculated for the Little Pine Creek reaches suggests that the existing conditions bankfull estimates are representative of regional hydrology and supports the use of the reference reach and the Little River and Laurel Branch LWP regional flood frequency curve in the selection of design discharge for the main stem restoration reaches.

Analysis of the bankfull discharge estimates for UT2 Reach 1, 2, and 3, UT2A, and UT2B show that the discharge – drainage area relationship fall near the North Carolina Mountain Curve and above the 1.2- and 1.8-year recurrence interval bands calculated from the Little River and Laurel Branch LWP regional flood frequency curve. This indicates that the drainage area – discharge relationship observed on the site tributaries is more similar to the relationship expressed in the North Carolina Mountain Curve. The discharge – drainage area data for the onsite UT2A reference reach also falls near the North Carolina Mountain Curve. The fact that the reference reach exhibits similar drainage area – discharge relationships to the drainage area – discharge relationships calculated for the other tributaries to Little Pine Creek reaches suggests that the existing conditions bankfull estimates as representative of regional hydrology and supports the use of the reference reaches and the North Carolina Mountain Curve in the selection of design discharge for the tributary restoration reaches.

5.6 Design Discharge

Based on the results of the analysis presented in Section 5.5 and Figure 8, design discharges were selected for the Little Pine Creek reaches. Design discharges for each of the Little Pine Creek reaches were selected to fall between the 1.2- and 1.8-year recurrence interval predictions of the regional flood frequency curves and to be generally consistent with the reference reach and existing bankfull drainage area – discharge relationships. Design discharges for each of the tributaries were selected to fall near the North Carolina Mountain Regional Curve.

The design discharge for UT1 was selected based primarily on comparison to the design discharges selected for the other reaches with small drainage areas. These reaches are UT2 – Reach 1 and UT2B which have larger and smaller drainage areas than UT1 respectively.

Table 7 summarizes the results of each of the discharge analyses described in this section.

Table 7. Design Discharge Analysis Summary – Little Pine Creek, UT2, UT2A, and UTB
Little Pine Creek III Stream & Wetland Restoration Project

Reach	Drainage Area (sq. miles)	Existing Cross Section, Manning's n value	Estimated Bankfull Flow (Manning's) (cfs)	NC Mountain Regional Curve Qbkf (cfs)	Little Pine River LWP Gage Analysis 1.2 YR	Little Pine River LWP Gage Analysis 1.8 YR	Design Q (cfs)
Little Pine Reach 1	3.9	XS13, 0.0325 XS15, 0.0325	199-211	284	177	223	205
Little Pine Reach 2a	4.3	XS17, 0.032	213	306	191	240	215
Little Pine Reach 2b	4.4	XS19, 0.0325	235	308	193	243	225
Meadow Fork - Reference	4.4	--	224	--	--	--	--
UT1		N/A	---	9	4	5	12
UT2 – Reach 1	0.12	XS3, 0.06	35	21	10	12	20
UT2 – Reach 2	0.31	XS9, 0.05	43	44	21	27	35
UT2A	0.14	XS8, 0.05	16	24	11	14	20
UT2A – Reference	0.12	--	20	--	--	--	--
UT2B	0.03	XS6, 0.06	8	7	3	4	10

6.0 Baseline Information –Wetland Summary

Table 8 presents the project information and baseline wetland information.

Table 8. Wetland Summary Information
Little Pine Creek III Stream & Wetland Restoration Project

	AA	BB	CC	DD	EE	FF	GG	HH	JJ
Size of Wetland (acres)	0.38	0.16	0.26	0.12	0.28	0.76	0.33	0.42	0.19
Wetland Type (non-riparian, riparian riverine, or riparian non-riverine)	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Riverine	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Non-Riverine	Riparian Non-Riverine
Mapped Soil Series	Chester loam CeE	Chester loam CeE	Chester loam CeE	Codorus complex Cx	Codorus complex Cx	Codorus complex Cx	Codorus complex Cx	Codorus complex Cx	Watauga loam (WaE)
Drainage Class	Well-drained	Well-drained	Well-drained	Well-drained	Well-drained	Well-drained	Well-drained	Well-drained	Well-drained
Soil Hydric Series	No	No	No	Yes	Yes	Yes	Yes	Yes	No
Source of Hydrology	Stream/ Ground-water	Stream/ Ground-water	Ground-water	Stream	Stream/ Ground-water	Stream/ Ground-water	Ground-water	Ground-water	Stream/ Ground-water
Hydrologic Impairment	N/A	N/A	N/A	N/A	N/A	Partially ditched	N/A	N/A	N/A
Native vegetation community	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest	Montane Alluvial Forest
% exotic invasive vegetation	10%	20%	10%	0%	0%	0%	0%	0%	0%

6.1 Jurisdictional Wetlands

On May 10 and July 18, 2012, and January 21, 2013 Wildlands delineated jurisdictional waters of the U.S. within the project easement area. Potential jurisdictional areas were delineated using the USACE Routine On-Site Determination Method. This method is defined by the 1987 Corps of Engineers Wetlands Delineation Manual and subsequent Eastern Mountain and Piedmont Regional Supplement. Routine On-Site Data Forms have been included in Appendix 2. The results of the on-site jurisdictional determination indicate that there are nine (9) jurisdictional wetlands located within the project easement.

6.1.1 Profile Description

Soil types within the project area include Alluvial land, wet (Ad), Ashe stony fine sandy loam (AsF), Chester clay loam (ChF2), Chester loam (CeE), Codorus complex (Cx), Gullied land (Gu), Tate loam (TaC), and Watauga loam (WaE and WaF). The majority of the project site is dominated by Alluvial land, Chester loam, and Codorus complex. Soil mapping units are based on the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey for Alleghany County. These soils are described in Section 4.3, Table 3. A soils map is provided in Figure 5.

6.1.2 Hydraulic Conductivity

The Alluvial land soils are poorly-drained and exhibit rapid permeability. Ashe stony fine sandy loam has a very low to low permeability. It consists of somewhat excessively drained soils. Chester soils are well-drained and exhibit moderately high permeability. Codorus soils are moderately well and somewhat poorly-drained. These soils have moderately high permeability. Tate loam soils are well drained and exhibit moderately high to high permeability. Watauga loam (WaE and WaF) soils are well drained with moderately high to high permeability.

6.2 Vegetation Community Types Descriptions and Disturbance History

The existing vegetation communities within the majority of on-site jurisdictional wetland areas are representative of stressed headwater forest or bottomland forest wetland types (NCWAM, 2010). Based on historical aerial photographs, farming and grazing has been prevalent on site since at least 1964. Due to constant agricultural activities and vegetation management over the past several decades, several major strata are partially to completely absent from these areas. The results are wetland areas dominated by herbaceous layers with few sparse mature trees. Dominant herbaceous species within these areas include strawcolored flatsedge (*Cyperus strigosus*), skunk cabbage (*Symplocarpus foetidus*), orange jewelweed (*Impatiens capensis*), soft stem rush (*Juncus effusus*), grass species (*Festuca* spp.), and smartweed (*Polygonum pensylvanicum*). Sparse tree species include red maple (*Acer rubrum*) and American sycamore (*Platanus occidentalis*).

7.0 Baseline Information - Regulatory Considerations

Table 9 presents the applicable project regulatory information.

Table 9. Regulatory Considerations
Little Pine Creek III Stream & Wetland Restoration Project

	Applicable?	Resolved?	Supporting Documentation
Waters of the US – Section 404	Yes	TBD	Appendix 2
Waters of the US – Section 401	Yes	TBD	Appendix 2
Endangered Species Act	Yes	Yes	Appendix 5
Historic Preservation Act	Yes	Yes	Appendix 5
Coastal Zone Management Act/Coastal Area Management Act	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Appendix 7
Essential Fisheries Habitat	Yes	Yes	Appendix 5

7.1 401/404

As discussed in Section 4.5, the results of the onsite field investigation indicate that seven channels including Little Pine Creek, UT1, UT2, UT2A, UT2B, UT3, and UT4 are jurisdictional within the project limits (Figure 5). Additionally there are nine jurisdictional wetland areas (Wetlands AA, BB, CC, DD, EE, FF, GG, HH, and JJ) located within the proposed project area. Each of the described tributaries and wetland features are protected under the conservation easement that was placed on the property. A copy of the Preliminary Jurisdictional Determination is included in Appendix 2.

Only minor temporary impacts to onsite wetlands are proposed. These impacts are necessary to install grade control structures to protect existing hydrology and prevent headcuts from migrating into the wetlands. Total wetland impacts will be less than 0.1-acre.

7.2 *Endangered and Threatened Species*

7.2.1 *Site Evaluation Methodology*

The Endangered Species Act (ESA) of 1973, amended (16 U.S.C. 1531 et seq.), defines protection for species with the Federal Classification of Threatened (T) or Endangered (E). An "Endangered Species" is defined as "any species which is in danger of extinction throughout all or a significant portion of its range" and a "Threatened Species" is defined as "any species which is likely to become an Endangered Species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. 1532).

Wildlands utilized the U.S. Fish and Wildlife Service (USFWS) and North Carolina Natural Heritage Program (NHP) databases in order to identify federally listed Threatened and Endangered plant and animal species for Alleghany County, NC (USFWS, 2008 and NHP, 2009). One federally listed species is currently listed in Alleghany County (Table 10): the bog turtle (*Clemmys muhlenbergii*).

Table 10. Listed Threatened and Endangered Species in Alleghany County, NC
Little Pine Creek III Stream & Wetland Restoration Project

Species	Federal Status	Habitat	Biological Conclusion
Vertebrate			
Bog turtle (*Clemmys muhlenbergii*)	T (S/A)	Wet muddy soil found in bogs, swamps and marshy meadows.	No effect
T (S/A) =Threatened due to similarity of appearance			

7.2.2 *Threatened and Endangered Species Descriptions*

Bog Turtle

The bog turtle is the smallest turtle in North America, approximately three to four inches in length and exhibiting orange to yellow patches on either side of the neck. This species is currently federally listed due to similarity of appearance with northern populations. These turtles live in the mud, grass and sphagnum of bogs, swamps, and marshy meadows. These areas typically exhibit hydrology from cool springs that provide slow overland flow. Typical threats to this species include illegal collection for the pet trade and habitat loss from draining and filling of wetlands for farming or development.

7.2.3 *Biological Conclusion*

A pedestrian survey of the site was performed on May 10, 2012. On site areas reviewed during the survey included active agricultural pastures, open wooded riparian areas, and small riparian seep wetlands. A small amount of potentially suitable habitat was found within the project area in the small headwater wetland areas (Wetlands AA, BB, and CC). These areas provide slow overland flow from adjacent stream channels and groundwater seeps; however, they are accessed by cattle frequently and are trampled and grazed. These headwater wetland areas provide moderate to poor quality habitat for the bog turtle. No individuals of bog turtle were found on-site during the pedestrian survey and it is determined that the proposed restoration and enhancement activities will have “no effect” on this Threatened species.

7.2.4 USFWS Concurrence

Wildlands requested review and comment from the USFWS on April 11, 2012, regarding the results of the site investigation and the Project’s potential impacts on threatened or endangered species. No response was received from the USFWS and Wildlands assumes that the site determination is correct and that no additional, relevant information is available for this site. All correspondence is included in Appendix 4. Marella Buncick with USFWS also field reviewed the site on August 15, 2012 during a meeting attended by representative from Wildlands, USACE, NCDWQ, USFWS, and EEP. During this meeting, the site was walked and the restoration approach was discussed. Ms. Buncick did not alert Wildlands to any potential threats to the bog turtle during this meeting or anytime thereafter.

7.3 Federally Designated Critical Habitat

No Federal Designated Critical Habitat is listed for Alleghany County.

7.4 Cultural Resources

7.4.1 Site Evaluation Methodology

The National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470), defines the policy of historic preservation to protect, restore, and reuse districts, sites, structures, and objects significant in American history, architecture, and culture. Section 106 of the NHPA mandates that federal agencies take into account the effect of an undertaking on any property that is included in, or is eligible for inclusion in, the National Register of Historic Places. A letter was sent to the North Carolina State Historic Preservation Office (SHPO) on April 11, 2012, requesting review and comment for the potential of cultural resources potentially affected by the Project.

7.4.2 SHPO/THPO Concurrence

A letter was sent to the North Carolina State Historic Preservation Office (SHPO) on April 11, 2012, requesting review and comment for the potential of cultural resources potentially affected by the Project. SHPO responded on May 3, 2012, and stated they were aware of no historic resources which would be affected by the project. All correspondence with SHPO is included in Appendix 4.

7.5 FEMA Floodplain Compliance and Hydrologic Trespass

The downstream 400 LF of Little Pine Creek near Big Oak Road is within a FEMA Zone AE floodplain on Firm panel 4010. The Zone AE floodplain is due to the backwater of Brush Creek; Little Pine Creek is not a FEMA-studied stream. It was confirmed through conversations with the local floodplain administrator that a hydraulic analysis of the restoration efforts on Little Pine Creek will not be required due to the Project’s location in the flood fringe of Brush Creek and not the non-encroachment area. Steep topography will prevent off-site flooding adjacent to the restoration areas.

7.6 Utilities and Site Access

There is one overhead utility line and associated 30-foot easement located at the downstream end of Little Pine Reach 2B. No grading is proposed near the power poles and the floodplain within the easement will be planted with herbaceous grasses only. Several 20- to 30-foot breaks in the conservation easement are proposed to provide the farmers access to their fields as depicted on Figure 10. Ford stream crossings will be provided along Little Pine Creek due to the size of the channel. A ford stream crossing will also be provided along UT3. Culvert crossings are proposed at easement breaks along UT1, UT2, and UT2A to provide stable access across the channel. All crossings will be fenced and gated to prevent livestock from wallowing in the streams. The farmer will be required to maintain these crossings. No mitigation credit is requested for the portions of the streams that are outside of the conservation easement.

8.0 Reference Sites

8.1 Reference Streams

Reference reaches can be used as a basis for design or, more appropriately, to provide support and guidance in the development of design parameters. Most reference quality reaches in the North Carolina Mountains are in heavily wooded areas and the mature vegetation contributes greatly to their stability. In addition, reference reaches tend to be located in higher gradient valleys with smaller drainage areas that are less prone to past and present disturbance. Multiple potential reference reaches were identified and field checked. Some of the sites evaluated were reference sites identified for previous EEP mitigation projects and some were new sites identified from desktop examination of existing topography and aerial photography.

Ultimately, two reference reaches were identified for use in the selection of design discharge described above in Section 5.6 and development of design parameters. The reference streams are the preservation section of UT2A onsite and Meadow Fork (Figure 9). UT2A and Meadow Fork were identified and surveyed for use in this project. These reference streams were chosen because of all the streams examined, they were the most similar to the project streams in terms of drainage area – discharge, hydrologic regime, valley slope, bed material, and physiographic location.

8.1.1 Reference Streams Channel Morphology and Classification

Meadow Fork is located along the Blue Ridge Parkway in southern Alleghany County approximately fourteen miles southwest of the project site. The drainage area is 4.4 square miles with a mix of agricultural and forested land use. A cross section and a longitudinal water surface profile were surveyed and a reach-wide pebble count was conducted. The stream is an E4 stream type with a width to depth ratio of 10.2 and an entrenchment ratio greater than 2.2. The water surface slope is 1.0%. The D_{50} of the bed material is 31 mm. The estimated bankfull discharge is 224 cfs. The reach is located in a pasture with a narrow woody buffer and is connected to the floodplain near the top of bank. The bed form is an alternating riffle pool sequence with armored coarse riffle substrate. The stream does meander slightly but is relatively straight. The drainage area – discharge relationship, riffle cross section morphology, and riffle slope ratios were used in the selection of project design discharge and morphological parameters

The UT2A reference reach is located on the project site within the mature canopy forest. The reach has a drainage area of 0.12 square miles. Riffle and pool cross sections and a longitudinal profile were surveyed. The stream is an A/B4/1 stream type with a width to depth ratio of 8.7 and an entrenchment ratio of 2.4. The bankfull slope is 4.3%. The estimated bankfull discharge is 20 cfs. The reach is located in a confined, alluvial valley. The bed form is an alternating riffle/run sequences with bedrock slides and some step pools. The drainage area – discharge relationship, riffle cross section morphology, and riffle slope ratios were used in the selection of project design discharge and morphological parameters.

The data for the reference sites is presented in Table 11.

Table 11. Summary of Reference Reach Geomorphic Parameters – Little Pine Creek Little Pine Creek III Stream & Wetland Restoration Project

			UT2A - Ref		Meadow Fork	
Parameter	Notation	Units	min	max	min	max
stream type			A/B4/1		E4	
drainage area	DA	sq mi	0.12		4.4	
bankfull discharge	Q_{bkf}	cfs	20		224	
bankfull cross-sectional area	A_{bkf}	SF	18.1		44	
average velocity during	v_{bkf}	fps	--		5.1	
width at bankfull	w_{bkf}	feet	12.6		21.4	
maximum depth at bankfull	d_{max}	feet	2.0		3.1	
mean depth at bankfull	d_{bkf}	feet	1.4		2.1	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		8.7		10.2	
depth ratio	d_{max}/d_{bkf}		1.4		1.5	
bank height ratio	BHR		1.0		1.1	
floodprone area width	w_{fpa}	feet	31		>200	
entrenchment ratio	ER		2.4		>2.2	
valley slope	S_{valley}	ft/ft	--		---	
channel slope	$S_{channel}$	ft/ft	0.0433		0.0100	
sinuosity	K		--		---	
riffle slope	S_{riffle}	ft/ft	0.0404	0.0517	0.0239	
riffle slope ratio	$S_{riffle}/S_{channel}$		0.9	1.2	2.0	
pool slope	S_{pool}	ft/ft	0.010	0.014	---	
pool slope ratio	$S_{pool}/S_{channel}$		0.2	0.3	---	
pool-to-pool spacing	L_{p-p}	feet	78		---	
pool spacing ratio	L_{p-p}/w_{bkf}		6.2		---	
maximum pool depth at bankfull	d_{pool}	feet	2.2	2.5	---	
pool depth ratio	d_{pool}/d_{bkf}		1.5	1.7	---	
pool width at bankfull	w_{pool}	feet	16.3		---	
pool width ratio	w_{pool}/w_{bkf}		1.3		---	
pool cross-sectional area at bankfull	A_{pool}	SF	23.2		---	
pool area ratio	A_{pool}/A_{bkf}		1.3		---	
belt width	w_{blt}	feet	---		---	
meander width ratio	w_{blt}/w_{bkf}		---		---	
meander length	L_m	feet	---		---	
meander length ratio	L_m/w_{bkf}		---		---	
radius of curvature	R_c	feet	---		---	
radius of curvature ratio	R_c/ w_{bkf}		---		---	

8.1.2 Reference Streams Vegetation Community Types Descriptions

The Meadow Fork reference site is located within a maintained agriculture field. The stream banks are heavily planted with tag alder (*Alnus serrulata*). Beyond the dense alder thickets the floodplain vegetation is pasture grasses such as fescue. The heavily wooded stream banks contribute to the stream's stability.

The UT2A reference section is encompassed by mature hardwood trees and has a good balance of canopy, understory, and herbaceous species that closely classifies as a Mesic Mixed Hardwood Forest (Schafale & Weakley, 1990). Canopy species include American Beech (*Fagus grandifolia*), Northern red oak, red maple, and tulip poplar. Common understory tree species include American holly, flowering dogwood, ironwood, red maple, and rhododendron.

8.2 Reference Wetland

Wetland AA, located along UT2 Reach 1, was identified as a reference condition wetland for the project site. Using the North Carolina Wetland Assessment Method (NCWAM) and the observer's best professional judgment, Wetland AA best classifies out as a headwater forest type wetland. Dominant canopy species include red maple, sycamore, southern red oak, and tulip poplar. The dominant shrub species include spicebush and tag alder, which grows in dense thickets throughout the wetland. Common herbaceous vegetation includes strawcolored nutsedge, skunk cabbage, orange jewelweed, and common rush.

8.2.1 Soil Characterization and Taxonomic Classification

The soils in Wetland AA are mapped as Chester loam. This floodplain area was confirmed to match the mapped soil unit which is described in more detail above.

8.2.2 Disturbance History

Historical aerials (Appendix 5) reveal that the reference wetland area has been vegetated from 1964 to present. Cattle have had access to the wetland over the years and there is minor impact from grazing activities including some trampling and browse impacts. There is a perimeter edge of multiflora rose (*Rosa multiflora*) at the upstream extent of the wetland.

9.0 Determination of Credits

Mitigation credits presented in Table 12 are projections based upon site design. Upon completion of site construction, the project components and credits data will be revised to be consistent with the as-built condition.

Table 12. Determination of Credits
Little Pine Creek III Stream & Wetland Restoration Project

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6,318	699	1.36	0.04	N/A	N/A	N/A	N/A	N/A

Project Components							
Project Component or Reach ID	Existing Footage / Acreage	Proposed Stationing/Location	Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage or Acreage	Mitigation Ratio	Proposed Credit
Little Pine Reach 1	4,016	100+00 to 113+66	P1 and P2	R	1,350[1]	1:1	1,350
Little Pine Reach 2A		113+66 to 124+07	P1	R	1,025[1]	1:1	1,025
Little Pine Reach 2B		124+07 to 128+88	P1 and P2	R	481	1:1	481
		128+88 to 133+92	Planting, fencing	R	488[1,2]	2.5:1	195
UT1	540	197+26 to 202+24	Planting, fencing	R	474[3]	2.5:1	190
		202+24 to 206+42	Planting, fencing, channel creation	R	418	2.5:1	167
UT2	5,270	297+18 to 342+61	P1, P2, P4, preservation	R	4,447[4]	2:1	2,224
UT2A	2,921	401+78 to 403+34 403+75 to 404+34	Grade control, planting, fencing	R	215	2.5:1	86
		405+12 to 425+87	Preservation	RE	2,075	5:1	415
		425+87 to 432+09	Planting, fencing	R	598[3]	2.5:1	239
UT2B	553	500+00 to 503+00	Planting, fencing	R	300	2.5:1	120
		503+00 to 505+41	P2	R	241	1:1	241
UT3	400	602+44 to 606+44	Preservation	RE	384[1]	5:1	77
UT4	1,036	700+00 to 709+93 714+65 to 715+08	Preservation	RE	1,036	5:1	207
Wetland AA	0.38	UT2 floodplain,	Planting, fencing	R	0.38	2:1	0.19
Wetland BB	0.16	UT2 floodplain,	Planting, fencing	R	0.16	2:1	0.08
Wetland CC	0.26	UT2B headwaters, station 500+63 to	Grade control, planting, fencing	R	0.26	2:1	0.13
Wetland DD	0.12	North of UT2/UT2A	Planting, fencing	R	0.12	2:1	0.06
Wetland EE	0.28	UT2 floodplain,	Planting, fencing	R	0.28	2:1	0.14
Wetland FF	0.76	North of UT1/Little Pine	Outlet stabilization, planting, fencing	R	0.76	2:1	0.38
Wetland	0.33	Little Pine	Planting, fencing	R	0.33	2:1	0.17

Project Components							
Project Component or Reach ID	Existing Footage / Acreage	Proposed Stationing/Location	Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage or Acreage	Mitigation Ratio	Proposed Credit
Wetland HH	0.42	South of UT4/Little Pine	Planting, grade control	R	0.42	2:1	0.21
Wetland JJ	0.19	UT4 floodplain,	Preservation	RE	0.19	5:1	0.04

Component Summation					
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
Restoration	3,097	N/A	N/A	N/A	N/A
Enhancement	N/A	2.71	N/A	N/A	N/A
Enhancement I	4,447	N/A	N/A	N/A	N/A
Enhancement II	2,493	N/A	N/A	N/A	N/A
Creation	N/A	N/A	N/A	N/A	N/A
Preservation	3,495	0.19	N/A	N/A	N/A

General comments: All farm crossings are located within the conservation easement boundaries. Culvert crossings need to have a minimum 16 foot top width, so a 24 foot bottom width is proposed to allow for side slopes and inlet/outlet protection as needed.
1: Excludes one 16 foot wide ford crossing.
2: Includes overhead utility easement.
3: Excludes one 24 foot wide constructed culvert crossing.
4: Excludes four 24 foot wide constructed culvert crossings.

10.0 Credit Release Schedule

All credit releases will be based on the total credit generated as reported by the as-built survey of the mitigation site. Under no circumstances shall any mitigation project be debited until the necessary DA authorization has been received for its construction or the District Engineer (DE) has otherwise provided written approval for the project in the case where no DA authorization is required for construction of the mitigation project. The DE, in consultation with the Interagency Review Team (IRT), will determine if performance standards have been satisfied sufficiently to meet the requirements of the release schedules below. In cases where some performance standards have not been met, credits may still be released depending on the specifics of the case. Monitoring may be required to restart or be extended, depending on the extent to which the site fails to meet the specified performance standard. The release of project credits will be subject to the criteria described as follows:

Table 13a. Credit Release Schedule – Forested Wetlands Credits
Little Pine Creek III Stream & Wetland Restoration Project

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50%
3	Third year monitoring report demonstrates performance standards are being met	10%	60%
4	Fourth year monitoring report demonstrates performance standards are being met	10%	70%
5	Fifth year monitoring report demonstrates performance standards are being met; Provided that all performance standards are met, the IRT may allow the NCEEP to discontinue hydrologic monitoring after the fifth year, but vegetation monitoring must continue for an additional two years after the fifth year for a total of seven years.	10%	80%
6	Sixth year monitoring report demonstrates performance standards are being met	10%	90%
7	Seventh year monitoring report demonstrates performance standards are being met, and project has received close-out approval	10%	100%

Table 13b. Credit Release Schedule – Non-forested Wetlands Credits
Little Pine Creek III Stream & Wetland Restoration Project

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	15%	55%
3	Third year monitoring report demonstrates performance standards are being met	20%	75%
4	Fourth year monitoring report demonstrates performance standards are being met	10%	85%
5	Fifth year monitoring report demonstrates performance standards are being met and project has received closeout approval	15%	100%

Table 13c. Credit Release Schedule – Stream Credits
Little Pine Creek III Stream & Wetland Restoration Project

Monitoring Year	Credit Release Activity	Interim Release	Total Released
0	Initial Allocation – see requirements below	30%	30%
1	First year monitoring report demonstrates performance standards are being met	10%	40%
2	Second year monitoring report demonstrates performance standards are being met	10%	50% (60%*)
3	Third year monitoring report demonstrates performance standards are being met	10%	60% (70%*)
4	Fourth year monitoring report demonstrates performance standards are being met	10%	75% (85%*)
5	Fifth year monitoring report demonstrates performance standards are being met and project has received closeout approval	15%	90% (100%)

10.1 Initial Allocation of Released Credits

The initial allocation of released credits, as specified in the mitigation plan can be released by the NCEEP without prior written approval of the DE upon satisfactory completion of the following activities:

a. Approval of the final Mitigation Plan
b. Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
c. Completion of project construction (the initial physical and biological improvements to the mitigation site) pursuant to the mitigation plan; Per the NCEEP Instrument, construction means that a mitigation site has been constructed in its entirety, to include planting, and an as-built report has been produced. As-built reports must be sealed by an engineer prior to project closeout, if appropriate but not prior to the initial allocation of released credits.
d. Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.

10.2 Subsequent Credit Releases

All subsequent credit releases must be approved by the DE, in consultation with the IRT, based on a determination that required performance standards have been achieved. For stream projects a reserve of 15% of a site's total stream credits shall be released after two bank-full events have occurred, in separate years, provided the channel is stable and all other performance standards are met. In the event that less than two bank-full events occur during the monitoring period, release of these reserve credits shall be at the discretion of the IRT. As projects approach milestones associated with credit release, the NCEEP will submit a request for credit release to the DE along with documentation substantiating achievement of criteria required for release to occur. This documentation will be included with the annual monitoring report.

11.0 Project Site Mitigation Plan

11.1 Designed Channel Classification

The design streams and wetlands will be restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities but also with strong consideration to existing watershed conditions and trajectory. The project includes stream restoration, enhancement, and preservation as well as wetland enhancement and preservation as shown in Figure 10. The specific proposed stream types are described below.

The stream restoration portion of this project includes:

- Little Pine Creek Reach 1: From the eastern project boundary to just upstream of the UT2 confluence.
- Little Pine Creek Reach 2A: From just upstream of the UT2 confluence to just upstream of where Little Pine Creek begins to follow the left valley wall (near Wetland GG).
- Little Pine Creek Reach 2B: From just upstream of where Little Pine Creek begins to follow the left valley wall (near Wetland GG) to approximately 500 LF upstream of Big Oak Road.
- UT2B from just upstream of the existing 6-foot headcut to the UT2 confluence.

The stream enhancement Level I portion of this project includes:

- UT2 from the upstream project boundary to the Little Pine confluence.

The stream enhancement Level II portion of this project includes:

- Little Pine Creek Reach 2B: From approximately 500 LF upstream of Big Oak Road to the upstream side of the Big Oak Road bridge.
- UT1 from the upstream project boundary to the proposed confluence with Little Pine Creek.
- UT2A from the upstream project boundary to the wood line.
- UT2A from the wood line to the UT2 confluence.
- UT2B from its origination within the project boundary to just upstream of the existing 6-foot headcut.

The stream preservation portion of this project includes:

- UT2A within the wood line.
- UT3.
- UT4.

11.1.1 Little Pine Creek Reaches 1, 2A, and 2B: Restoration

Little Pine Creek Reaches 1 and 2A will be constructed as a C type stream according to the Rosgen classification system (Rosgen, 1996). Type C streams are slightly entrenched, meandering streams with well-developed floodplains and gentle gradients of 2% or less. They occur within a wide range of valley types and are appropriate for the project landscape.

The upper several hundred feet of Little Pine Creek Reach 2B utilizes a restoration approach in dimension and profile and has a slightly meandering pattern with a lower belt width and sinuosity than project design parameters suggest. This stream segment provides a transition between the stream restoration approach used in Reach 2A to an Enhancement II approach which is used for the remaining portion of Reach 2B below the transitional reach.

The morphologic design parameters as shown in Table 14a for the Little Pine Creek restoration reaches fall within the ranges specified for C streams (Rosgen, 1996). However, the specific values for the design parameters were selected based on designer experience and judgment and were verified with morphologic data form reference reach data sets.

The design channel slopes of the Little Pine Creek restoration reaches range from approximately 0.5% to 0.7%. Each of the design reaches will be connected with the existing floodplain (Priority 1). The restored channels will have entrenchment ratios greater than 2.2. The sinuosity for the restored channels will be near 1.2 for Reach 1 and Reach 2A.

Table 14a. Design Morphologic Parameters – Little Pine Creek
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	Little Pine Reach 1		Little Pine Reach 2A		Little Pine Reach 2B	
			Min	Max	Min	Max	Min	Max
Stream Type			C4		C5		C4	
Drainage Area	DA	sq mi	3.9		4.3		4.4	
Design Discharge	Q	cfs	205		215		225	
Bankfull Cross-Sectional Area	A_{bkf}	SF	54.5		53.0		54.9	
Average Velocity During	v_{bkf}	fps	3.8		4.0		4.1	
Width at Bankfull	w_{bkf}	feet	30.0		30.0		31.0	
Maximum Depth at Bankfull	d_{max}	feet	2.5		2.5		2.5	
Mean Depth at Bankfull	d_{bkf}	feet	1.8		1.8		1.8	
Bankfull Width to Depth	w_{bkf}/d_{bkf}		16.5		17.0		17.5	
Low Bank Height			2.5		2.5		2.5	
Bank Height Ratio	BHR		1.0		1.0		1.0	
Floodprone Area Width	w_{fpa}	feet	>200		>200		>200	
Entrenchment Ratio	ER		>2.2		>2.2		>2.2	
Valley Slope	S_{valley}	ft/ft	0.0057		0.0082		0.0089	
Channel Slope	$S_{channel}$	ft/ft	0.0050		0.0070		0.0111	
Riffle Slope	S_{riffle}	ft/ft	0.0070	0.0125	0.0098	0.0175	0.0155	0.0278
Riffle Slope Ratio	$S_{riffle}/S_{channel}$		1.4	2.5	1.4	2.5	1.4	2.5
Pool Slope	S_{pool}	ft/ft	0.0000	0.0010	0.0000	0.0014	0.0000	0.0022
Pool Slope Ratio	$S_{pool}/S_{channel}$		0.0	0.2	0.0	0.2	0.0	0.2
Pool-to-Pool Spacing	L_{p-p}	feet	75	270	75	270	78	279
Pool Spacing Ratio	L_{p-p}/w_{bkf}		2.5	9.0	2.5	9.0	2.5	9.0
Sinuosity	K		1.14		1.17		1.01	
Belt Width	w_{blt}	feet	45	210	45	210	47	217
Meander Width Ratio	w_{blt}/w_{bkf}		1.5	7.0	1.5	7.0	1.5	7.0
Meander Length	L_m	feet	210	360	210	360	217	372
Meander Length Ratio	L_m/w_{bkf}		7.0	12.0	7.0	12.0	7.0	12.0
Radius of Curvature	R_c	feet	60	120	60	120	62	124
Radius of Curvature Ratio	R_c/w_{bkf}		2.0	4.0	2.0	4.0	2.0	4.0

11.1.2 Little Pine Creek Reach 2B: Enhancement II

The enhancement II approach on Little Pine Creek Reach 2B includes planting the entire right bank riparian buffer and planting the portions of the left bank buffer which are not already wooded. Native seed and saplings will be used. Livestock will be excluded from the reach with fencing.

11.1.3 UT1: Enhancement II

The enhancement II approach on UT1 includes enhancing the sparse riparian buffer along the existing stream with native plantings. Livestock will also be excluded from the reach with fencing. The proposed Little Pine Creek design shifts Little Pine into its left floodplain, so UT1 needs to be extended to meet the new Little Pine Creek location. The proposed UT1 alignment is located roughly in the old alignment of Little Pine Creek to maintain surface hydrology along the border of Wetland FF. See Figure 10.

11.1.4 UT2 Reaches 1 and 2: Enhancement I

As discussed in the stream geomorphology section of this document (Section 5.2.3), UT2 exhibits highly varied morphology and channel conditions throughout the site. For example, due to the high slope of UT2 Reach 1, incision tends to be isolated to areas only a few hundred feet in length. The general pattern of incision observed along UT2 Reach 1 included a large headcut at the beginning of each incised area and a stabilizing feature such as bedrock at the end of each incised area. In contrast, UT2 Reaches 2 and 3 have more gently sloped valleys and exhibit more consistent incision and lateral erosion, particularly downstream of the UT2A confluence. Due to the rapidly changing stream conditions along the entire length of UT2, Wildlands has tailored a mix of different levels of restoration, enhancement, and preservation for the stream to appropriately address its instability. The prescribed approaches are depicted fully on the plan set. Wildlands determined the average effort across the entire length of UT2 is equivalent to an enhancement level I approach, and have depicted the restoration approach as such on Figure 10.

For design purposes, UT2 is broken into two reaches: Reach 1 and Reach 2. Please note that these reaches differ from the existing condition reaches – refer to Figures 3 and Figure 10 for comparison.

As shown in the plans, portions of UT2 Reach 1 will have their dimension, pattern, and profile addressed. In these sections, a B4a-type channel will be constructed. A high bankfull width to depth ratio was selected to allow for low bank slopes of 3.5:1, which will result in lower bank stresses and allow for vegetation establishment on the newly constructed channel banks. The design channel slope is steep, ranging from 4.5 to 6.2%. Series of step-pools constructed with logs and short, steep coarse riffles with grade control have been proposed to drop elevation while maintaining stability. The reference portion of UT2A was used to assist with development of design ratios along this reach, along with observations from academic literature on step-pool morphology (Chartrand et.al, 2011). Portions of UT2 Reach 1 with localized bed and bank instabilities will be addressed with a heavy enhancement approach. Headcuts will be addressed with in-stream structures and areas of bank erosion will be addressed through bank grading and stabilization. Where UT2 Reach 1 enters the mature forest and exhibits good bed and bank stability, only preservation with cattle exclusion is proposed. Morphological parameters proposed for UT2 Reach 1 are presented in Table 14b.

Table 14b. Design Morphologic Parameters – UT2 – Reach 1
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	UT2 – Reach 1					
			Upper		Middle		Lower	
			Min	Max	Min	Max	Min	Max
Stream Type			B4a					
Drainage Area	DA	sq mi	0.12					
Design Discharge	Q	cfs	20					
Bankfull Cross-Sectional Area	A_{bkf}	SF	4.4					
Average Velocity During	v_{bkf}	fps	4.5					
Width at Bankfull	w_{bkf}	feet	9.0					
Maximum Depth at Bankfull	d_{max}	feet	0.70					
Mean Depth at Bankfull	d_{bkf}	feet	0.49					
Bankfull Width to Depth	w_{bkf}/d_{bkf}		18.5					
Low Bank Height			0.70					
Bank Height Ratio	BHR		1.0					
Floodprone Area Width	w_{fpa}	feet	17			98		
Entrenchment Ratio	ER		1.9			10.9		
Valley Slope	S_{valley}	ft/ft	0.0637		0.0463		0.0525	
Channel Slope	$S_{channel}$	ft/ft	0.0615		0.0451		0.0501	
Riffle Slope	S_{riffle}	ft/ft	0.0662	0.0752	0.0528	0.0806	0.0512	0.0681
Riffle Slope Ratio	$S_{riffle}/S_{channel}$		1.1	1.2	1.2	1.8	1.0	1.4
Pool Slope	S_{pool}	ft/ft	0.0	0.0246	0.0	0.0180	0.0	0.0201
Pool Slope Ratio	$S_{pool}/S_{channel}$		0.0	0.4	0.0	0.4	0.0	0.4
Pool-to-Pool Spacing	L_{p-p}	feet	6.4	14.0	5.8	51.2	6.5	41.5
Pool Spacing Ratio	L_{p-p}/w_{bkf}		0.7	1.6	0.6	5.7	0.7	4.6
Sinuosity	K		1.04		1.03		1.05	
Belt Width	w_{blt}	feet	N/A	N/A	N/A	N/A	N/A	N/A
Meander Width Ratio	w_{blt}/w_{bkf}		N/A	N/A	N/A	N/A	N/A	N/A
Meander Length	L_m	feet	N/A	N/A	N/A	N/A	N/A	N/A
Meander Length Ratio	L_m/w_{bkf}		N/A	N/A	N/A	N/A	N/A	N/A
Radius of Curvature	R_c	feet	N/A	N/A	N/A	N/A	N/A	N/A
Radius of Curvature Ratio	R_c/ w_{bkf}		N/A	N/A	N/A	N/A	N/A	N/A

UT2 Reach 2 is relatively stable near its upstream extents with only isolated areas of bank erosion, which will be corrected with bank grading and stabilization. Below the UT2A confluence, the reach becomes incised and laterally unstable. Incision and lateral instability observed here will be corrected by restoring proper dimension, pattern, and profile to the stream. A C4b-type channel will be constructed. As with UT2 Reach 1, a high bankfull width to depth ratio with low bank slopes was selected to aid in vegetation establishment. Grade control will be utilized throughout this reach in the form of constructed riffles and log steps. Morphological parameters proposed for UT2 Reach 2 are presented in Table 14 c.

Table 14c. Design Morphologic Parameters – UT2 – Reach 2
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	UT2 – Reach 2	
			Min	Max
Stream Type			C4b	
Drainage Area	DA	sq mi	0.31	
Design Discharge	Q	cfs	35	
Bankfull Cross-Sectional Area	A_{bkf}	SF	7.6	
Average Velocity During Bankfull	v_{bkf}	fps	4.6	
Width at Bankfull	w_{bkf}	feet	11.6	
Maximum Depth at Bankfull	d_{max}	feet	0.95	
Mean Depth at Bankfull	d_{bkf}	feet	0.65	
Bankfull Width to Depth Ratio	w_{bkf}/d_{bkf}		17.7	
Low Bank Height			0.95	
Bank Height Ratio	BHR		1.0	
Floodprone Area Width	w_{fpa}	feet	17	195
Entrenchment Ratio	ER		1.5	16.8
Valley Slope	S_{valley}	ft/ft	0.0280	
Channel Slope	$S_{channel}$	ft/ft	0.0239	
Riffle Slope	S_{riffle}	ft/ft	0.0260	0.0459
Riffle Slope Ratio	$S_{riffle}/S_{channel}$		1.1	1.9
Pool Slope	S_{pool}	ft/ft	0.0000	0.0048
Pool Slope Ratio	$S_{pool}/S_{channel}$		0.0	0.2
Pool-to-Pool Spacing	L_{p-p}	feet	18.5	94.7
Pool Spacing Ratio	L_{p-p}/w_{bkf}		1.6	8.2
Sinuosity	K		1.20	
Belt Width	w_{blt}	feet	45	68
Meander Width Ratio	w_{blt}/w_{bkf}		3.9	5.9
Meander Length	L_m	feet	88	135
Meander Length Ratio	L_m/w_{bkf}		7.6	11.7
Radius of Curvature	R_c	feet	29	39
Radius of Curvature Ratio	R_c/ w_{bkf}		2.5	3.4

11.1.5 UT2A: Preservation

UT2A is stable through the mature forest and will be preserved as is. Fencing will be provided as needed to ensure livestock exclusion.

11.1.6 UT2A: Enhancement II

UT2A suffers from moderate instability from the upstream project boundary to where it enters the mature forest. Through this reach, one grade control structure will be placed. As UT2A enters maintained pasture downstream of the mature forest, the stream remains relatively stable with spot areas of erosion concentrated on the outside of meander bends. One unstable meander bend will be corrected through channel realignment, while bank grading and stabilization is proposed to correct instabilities throughout the remainder of the reach. In-stream grade control structures are proposed on the relocated portion of UT2A to stabilize the bed in its new alignment. Morphological parameters proposed for UT2A are presented in Table 13d.

11.1.7 UT2B: Enhancement II

From its origination within the project limits to just upstream of the 6-foot headcut, UT2B's sparse riparian buffer will be enhanced with native plantings. Livestock will be excluded from the reach with fencing.

11.1.8 UT2B: Restoration

UT2B becomes highly unstable at a 6-foot headcut located at the base of tree roots. A B4a-type channel will be constructed in the approximate area of the old channel. A high bankfull width to depth ratio was selected to allow for low bank slopes, which will result in lower bank stresses and allow for vegetation establishment on the newly constructed channel banks. The channel slope is 6.4%. Series of step-pools constructed with logs and short, steep coarse riffles with grade control have been proposed to drop elevation while maintaining stability. The reference portion of UT2A was used to assist with development of design ratios along this reach, along with observations from academic literature on step-pool morphology (Chartrand et.al, 2011). Morphological parameters proposed for UT2B are presented in Table 14d.

Table 14d. Design Morphologic Parameters –UT2A and UT2B
Little Pine Creek III Stream & Wetland Restoration Project

	Notation	Units	UT2A		UT2B	
			Min	Max	Min	Max
Stream Type			B4a		B4a	
Drainage Area	DA	sq mi	0.14		0.03	
Design Discharge	Q	cfs	20		10	
Bankfull Cross-Sectional Area	A_{bkf}	SF	3.4		2.1	
Average Velocity During	v_{bkf}	fps	5.8		4.7	
Width at Bankfull	w_{bkf}	feet	7.4		5.9	
Maximum Depth at Bankfull	d_{max}	feet	0.75		0.55	
Mean Depth at Bankfull	d_{bkf}	feet	0.47		0.35	
Bankfull Width to Depth Ratio	w_{bkf}/d_{bkf}		15.7		16.8	
Low Bank Height			0.75		0.55	
Bank Height Ratio	BHR		1.0		1.0	
Floodprone Area Width	w_{fpa}	feet	11	43	15	30
Entrenchment Ratio	ER		1.5	5.8	2.5	5.1
Valley Slope	S_{valley}	ft/ft	0.0490		0.0667	
Channel Slope	$S_{channel}$	ft/ft	0.0470		0.0639	
Riffle Slope	S_{riffle}	ft/ft	0.0354	0.0530	0.0436	0.0750
Riffle Slope Ratio	$S_{riffle}/S_{channel}$		0.8	1.1	0.7	1.2
Pool Slope	S_{pool}	ft/ft	0.0000	0.0188	0.0000	0.0256
Pool Slope Ratio	$S_{pool}/S_{channel}$		0.0	0.4	0.0	0.4
Pool-to-Pool Spacing	L_{p-p}	feet	11.2	22.2	4.7	21.0
Pool Spacing Ratio	L_{p-p}/w_{bkf}		1.5	3.0	0.8	3.5
Sinuosity	K		1.12		1.04	
Belt Width	w_{blt}	feet	N/A	N/A	N/A	N/A
Meander Width Ratio	w_{blt}/w_{bkf}		N/A	N/A	N/A	N/A
Meander Length	L_m	feet	N/A	N/A	N/A	N/A
Meander Length Ratio	L_m/w_{bkf}		N/A	N/A	N/A	N/A
Radius of Curvature	R_c	feet	N/A	N/A	N/A	N/A
Radius of Curvature Ratio	R_c/ w_{bkf}		N/A	N/A	N/A	N/A

11.2 Wetland Design

The proposed stream and wetland restoration project includes nine distinct wetland zones. The eight riparian wetland enhancement zones include Wetland AA, BB, CC, DD, EE, FF, GG, and HH. Wetland JJ is planned for preservation (Figure 10).

Wetland AA, BB, CC, DD, EE, FF, GG, and HH are all proposed for enhancement through cattle exclusion and supplemental planting. Planted species will include black gum (*Nyssa sylvatica*), sycamore, river birch, silky dogwood (*Cornus amomum*), tag alder, box elder (*Acer negundo*), and spicebush (*Lindera benzoin*). Small pockets of multiflora rose observed in Wetlands AA, BB, and CC will be removed. Wetland CC contains two outlet ditches which are actively eroding and threatening the hydrology of the system. These ditches will be stabilized with log steps to prevent further erosion. UT1 currently flows through Wetland FF, and a grade control structure will be installed on UT1 to protect against channel incision. A log step structure will be installed at the outlet of Wetland HH to protect against potential erosion as well. Wetland JJ is proposed for preservation only.

11.3 Target Buffer Communities

The target communities for the restored riparian buffer zones will be based on the following:

- Reference conditions from forested areas within or adjacent to the project site;
- Native trees, appropriate for the physiographic setting, with proven success in early successional restoration sites;
- Vegetation listed for the community types in Classification of the Natural Communities of North Carolina (Schafale and Weakley, 1990) likely to occur on the site; and
- Consultation with native tree suppliers.

The natural community type for the conversion of the Little Pine Creek floodplain from pasture to forest is Piedmont/Mountain Bottomland Forest. The Rich Cove natural community type is applicable to reforestation along the tributary valleys based on topography and soil type.

11.4 Stream Project and Design Justification

Based on assessments of the watershed and existing channels, the project design has been developed to correct system wide channel instability observed along Little Pine Creek and its tributaries caused by livestock access, lack of woody riparian vegetation, and potential historical channelization. The observed impairments include bank erosion, lateral migration, variable floodplain connection, poor ambient water quality, and lack of stable instream habitats.

According the Simon channel evolution model (Simon, 1989), Little Pine Creek Reach 1, 2A, and 2B could be described as a mix of *Stage III – Degradation, Stage IV – Degradation and Widening,* and *Stage V – Aggradation and Widening.* Severe bank erosion is occurring in many locations, indicating widening and lateral migration. Riffle features are either very coarse, steep, and short or embedded with deposition sands. Pools are infrequent and are generally shallow. Depositional features including side bars, mid channel bars, and transverse bars are present. If not for continual livestock access and pasture maintenance, channel adjustment processes would likely continue to evolve into *Stage VI – Quasi-Equilibrium.* However, these processes take decades to progress and often recovered systems do not attain the level of stream function recovery that restored systems can achieve in much shorter time frames. If livestock are not excluded, there would be no potential for the streams to recover.

UT2 Reach 1 has several sections of isolated incision with poor bedform and extreme bank erosion while UT2 Reach 2 exhibited reach wide lateral and vertical instability through the cattle pasture. Although areas of isolated incision on Reach 1 were generally found to have grade control in the form of bedrock at their base, headcut migration at the upstream extent is a potential concern as is the loss of floodplain/stream interaction. Reach 2 has reach-wide lateral instability that warrants intervention due to the amount of erosion that would have to occur in order for the reach to find equilibrium.

Spot stabilization, relocation, and instream structure on both the upstream most and downstream most section of UT2A will correct lateral instabilities, improve available habitat, and prevent the loss of further sediment to downstream waters.

The 6-foot headcut on UT2B is temporarily stabilized by large tree roots. The earth supporting the roots across the top of the head cut continues to erode and the eventual migration of the head cut is inevitable. Migration of the head cut would result in the loss of stable bedform of UT2B upstream of the tree, as well as loss of hydrology for Wetland CC. Therefore, restoration of UT2B below the headcut to a stable, step-pool type channel is considered essential not only for recovery of lost habitat and in-stream processes on the eroded portion of the stream, but also to protect the functioning streams and wetlands upstream.

The design objectives were developed to deal with the issues described in the paragraphs above. The key factors driving the need for this intervention are:

- Without intervention, it is likely that lateral erosion and vertical instability observed on the project reaches will continue for decades, contributing a large volume of sediment to downstream waters.
- Intervention is required to restore aquatic, benthic, and riparian habitat.
- Treatment of agricultural runoff is needed to reduce nutrient loads and help meet nutrient reduction goals in downstream waters. The restored floodplain will provide both increased flood storage and treatment.
- The project offers the opportunity to meet many goals established in the EEP watershed planning documents.

11.5 Sediment Transport Analysis

To begin an analysis of sediment supply a watershed assessment must be performed. Wildlands staff performed a watershed reconnaissance, reviewed a series of aerial photographs dating back to the 1960's, and reviewed land cover data in order to assess the current condition of the watersheds and identify time periods when the watersheds underwent changes that would affect the sediment load such as development or land clearing. As previously described, land cover within the watersheds has remained relatively consistent since 1964. There are no signs that land disturbance is likely in the near future of this rural watershed. In general the watersheds are actively used for timber production, livestock grazing, and agricultural production. Regular timber harvesting, rotational grazing, and crop tillage is expected to continue and during these disturbance intervals, additional sediment is expected to be contributed to the channel system.

A sediment transport analysis was performed for the Little Pine Creek restoration reaches. In general, the analysis was performed to answer two questions:

1. What size bed material particles will become entrained at flows at or near the bankfull discharge (competence)? and
2. Does the stream have the ability to pass the sediment load supplied to it (capacity)?

The analysis performed for this project addresses both the competence and capacity questions with the information available. Stream competence can be determined through calculations performed with data commonly collected for stream restoration projects. The issue of capacity is much more difficult to analyze due to lack of reliable data on sediment supply for a given stream and, therefore, must often be analyzed qualitatively – unless initial qualitative analysis warrants further field data collection.

All three of the Little Pine reaches proposed for restoration were determined to be gravel bed streams but the reaches have a cobble component to the bed material. The proposed condition bed material will be largely comprised of salvaged onsite bed material initially. In gravel bed streams, bed load is the dominant component of sediment transport (Wilcock, et al., 2009). Therefore bed load was the focus of this sediment transport analysis.

11.5.1 Competence Analysis

A competence analysis was performed for each of the design reaches by comparing shear stresses along the channel at the design bankfull discharge with the size distribution of the bed material. Standard equations were used to calculate the critical dimensionless shear stress needed to move the bed material and the depth and slope combination needed to produce that stress. The equations are:

Equation 1 (use if $3 < d_{50}/ds_{50} > 7$): $\tau_{ci} = 0.0834(d_{50}/ds_{50})^{-0.872}$ (Andrews, 1984)

Equation 2 (use if $1.3 < Di/d_{50} > 3$): $\tau_{ci} = 0.0384(Di/d_{50})^{-0.887}$ (Andrews et.al., 1995)

Equation 3: $d = (\tau_{ci} * \gamma s * Di)/S$ (Rosgen, 2001)

where τ_{ci} is critical dimensionless shear stress, d_{50} is median diameter of pavement material, ds_{50} is median diameter of subpavement or bar material, γs is specific weight of sediment, Di is the largest diameter of subpavement material, d is mean bankfull depth of channel, and S is the water surface slope at bankfull stage.

Critical depth and slope combinations were calculated for each design reach using equations 1 through 3 above. The results of this analysis were compared to channel size and slope from hydraulic calculations based on the selected design discharge. Calculated critical depth, slope and shear stress compared well to design channel depth, slope, and shear stress within the expected range of error from the sediment transport equations. The results of these competence analyses for the restoration reaches indicated that no adjustment to channel size or slope as designed is necessary to adequately move sediment through the systems.

Table 15a. Dimensionless Critical Shear Stress Calculations – Little Pine Creek
Little Pine Creek III Stream & Wetland Restoration Project

	Little Pine Creek Reach 1 Existing	Little Pine Creek Reach 1 Design	Little Pine Creek Reach 2A Existing	Little Pine Creek Reach 2A Design	Little Pine Creek Reach 2B Existing	Little Pine Creek Reach 2B Design
Calculated $d_{critical}$ (ft)	2.2	1.5	2.3	1.9	0.6	1.2
Riffle mean depth (ft)	1.4	1.8	2.1	1.8	1.8	1.8
Calculated $S_{critical}$ (ft/ft)	0.009	0.004	0.006	0.008	0.0074	0.0075
Channel slope (ft/ft)	0.006	0.005	0.006	0.007	0.0224	0.0111
D100 subpavement (mm)	113		77		81	
Critical shear stress required to move largest subpavement particle[1]	0.47		0.40		0.42	
Design discharge boundary shear stress (lbs/ft^2)	0.85	0.56	0.66	0.75	2.43	1.20
Mobile particle size at design discharge boundary sheet stress (mm)[1]	134	99	112	123	289	174
1: From Shields Diagram revised with Rosgen Data						

The results of the competence analyses of Little Pine indicate that there is enough shear stress to mobilize the bed material at bankfull flow. This result indicates that the channel will likely move the bed load and the channel may have some excess competence, which, without proper grade control, could lead to bed scour. Bed accretion is not expected to be a problem. It should be noted that the equations are particularly sensitive to the sediment samples collected at discrete locations and points in time. Little Pine Creek was observed to have highly variable and adjusting sedimentation patterns and processes due to the active channel adjustment mechanisms and underlying stability. It is important to recognize that competency equations are approximate and focusing on small differences in exact values can be misleading.

However, measures will be taken to prevent scour at key locations in the channel, especially riffles. Grade control structures including reinforced constructed riffles, J-hook vanes, and others will be installed during construction at locations were bed scour potential is significant. Natural material revetments such as brush toe will be used along with some bank structures to prevent bank erosion.

Table 15b. Dimensionless Critical Shear Stress Calculations – UT2 and UT2B
Little Pine Creek III Stream & Wetland Restoration Project

	UT2 Reach 1 Existing	UT2 Reach 1 Design	UT2 Reach 2/3 Existing	UT2 Reach 2 Design	UT2B Existing	UT2B Design
Calculated $d_{critical}$ (ft)	0.1	0.1	0.4	0.3	0.2	0.1
Riffle mean depth (ft)	0.9	0.47	1.2	0.65	0.3	0.35
Calculated $S_{critical}$ (ft/ft)	0.0046	0.0084	0.0049	0.0091	0.0241	0.0211
Channel slope (ft/ft)	0.0310	0.0615, 0.0451, 0.0501	0.0144	0.0239	0.0410	0.0639
D100 subpavement (mm)	49		46-107		87	
Critical shear stress required to move largest subpavement particle[1] (lbs/ft2)	0.2		0.2		0.5	
Design discharge boundary shear stress	1.53	1.84, 1.34, 1.49	0.73	0.96	0.75	1.38
Mobile particle size at design discharge	208	238, 189, 204	121	148	123	193
1: From Shields Diagram revised with Rosgen Data						

The results of the competence analyses of UT2 and UT2B indicate a strong degradational tendency when comparing critical depths, slopes, and shear stresses to the design. This is to be expected given the colluvial nature of these valleys and the high slope of the streams. Naturally, these streams are degradational and grade control in the form of boulder, rock, and log structures will be implemented throughout the reaches.

In-stream structures and revetments for Little Pine Creek, UT2, and UT2B are shown on the design plans and described below in Section 10.6.1.

11.5.2 Capacity Analysis

A capacity analysis is necessary to determine if the stream has the ability to pass its sediment load. A capacity analysis is much more difficult to perform than a competence analysis and is prone to error. In order to perform the analysis, an estimate of sediment supply must be developed and compared with computation of the stream's ability or capacity to move the load. A logical approach to evaluate the capacity of the proposed streams to move their sediment load is as follows:

1) Evaluate the historic and current condition of the subject watershed and identify any trends in land use changes or other disruptions to sediment supply
2) Evaluate the existing channels and, to the extent possible, the historic conditions of the channels for indications that the channels have a large supply of bedload material
3) Using information obtained in #1 and #2 above, qualitatively classify the streams in terms of the apparent sediment supply and predict any future changes that may impact sediment supply
4) If it is apparent that the streams are low bedload streams and the sediment supply is not expected to change, then a threshold channel design may be appropriate
5) If there are indications that the bedload supply is large, field data should be collected to more accurately quantify the incoming bedload and detailed calculations should be performed to verify that the proposed designs will move the bedload. In these cases, bedload transport capacity is a significant element of the design and threshold channel design is not appropriate.

In the case of Little Pine Creek and its tributaries, there have not been major changes to land use in the watershed for some time. As discussed in Section 4.1, a review of historic aerial photography revealed that the land use within the watershed has remained relatively consistent over the past 49 years. Wildlands' field review of the watershed did not identify any widespread floodplain or overland erosion, extensive recent development, or other potential sources for increased or decreased sediment supply.

From the summer of 2012 to the summer of 2013, Wildlands has visited the project site frequently to conduct existing conditions surveys and perform design analysis. The depositional features observed within the onsite streams have been relatively stable with little shifting or changes in dimension and location over the past year of observation. Two onsite scour chains observed during this period indicated that riffles neither aggraded nor degraded despite a near bankfull event as recorded by onsite crest gages. Wildlands also had the opportunity to field review a 2008 detailed topographic survey of Little Pine Creek upstream of the project site. Wildlands' field review was conducted in the summer of 2013, approximately 5 years after the date of the survey. Bars and islands noted on the survey were still evident in the field and appeared to be to the same dimensions and elevations as originally surveyed. Based on Wildlands review of onsite sediment deposition patterns and the upstream survey, it appears that the Project streams are low bedload and that sediment supply is not expected to change. Threshold channels, where only competence is evaluated quantitatively, have been designed for the site. Based on the competence and capacity analysis, only degradation is a potential concern for onsite streams, which will be addressed through use of grade control structures.

11.6 Project Implementation Summary

The stream and wetland restoration will be constructed as described in this section. A full set of preliminary design plans is included with this mitigation plan for review.

11.6.1 Site Grading, Structure Installation, and Other Project Related Construction

The stream restoration and enhancement Level I elements of the project (where dimension, pattern, and profile are addressed) will be constructed primarily as Rosgen Priority 1 restoration with transitional areas constructed as Priority 2 at the upstream and downstream boundaries to tie into the existing channels. The upper portion of Little Pine Creek Reach 1 and lower portions of Little Pine Creek Reach 2B are transitional areas where floodplain excavation is required on either the left or right stream valley. These areas are limited and, in general, require cutting the floodplain 2 feet or less. The construction will result in channels sized to convey the design discharge. Flows above the design discharge will frequently flood the adjacent floodplain. The reconstructed channel banks will be built with stable side slopes, planted with native materials, matted, and seeded for stability. The streams will be built to mimic natural systems and allow the stream to maintain distinct pools and riffles and dissipate and collect energy via convergent and divergent flow dynamics. Generally pools will occur in the outside of the meander bends and riffles will be located in the straight sections of channel between meanders on lower sloped streams throughout the project. Riffle-pool sequences such as those that will be built in the new channels are common for gravel bed streams and provide energy dissipation and aquatic habitat. For higher sloped streams throughout the project, step-pool and riffle-run sequences will be constructed, allowing for vertical energy dissipation and aquatic habitat typical of similarly sloped natural streams.

The Enhancement II elements of the project will involve discrete areas of streambank grading, minimal in-stream habitat structures, and riparian buffer establishment.

Scaled Schematic of Grading

The proposed grading is included in the preliminary design plans.

In-Stream Structures and Other Construction Elements

Grade control is an important element of the design and many riffles will be constructed with grade control features. These include native gravel/cobble material riffles harvested from the existing channel, native material riffles reinforced with larger cobble, boulder and log sills, and cross vanes. Log vanes and log j-hook vanes will be among other in-stream structures constructed along the stream project. These structures will provide additional grade control and will deflect flows away from banks while creating habitat diversity. The channel banks will also be armored with native materials from the site including brush toe. These structures and revetments are shown on the preliminary design plans. A mix of log and rock structures will be used on this site due to the occurrence of woody debris and large cobble features found in the existing channels and reference reaches.

Ford and culvert crossings will be provided throughout the site to allow landowner access to both sides of the streams. These are depicted on the plan set and summarized below in Table 15. Fencing and gates will be installed to keep livestock out of the conservation easement and the stream channel.

Table 16. Proposed Crossings
Little Pine Creek III Stream & Wetland Restoration Project

Reach	Width of Crossing Area (LF)	Crossing Type	Approximate Crossing Station
Little Pine Creek Reach 1	16	Ford	107+22
Little Pine Creek Reach 2A	16	Ford	123+76
Little Pine Creek Reach 2B	16	Ford	132+00
UT1	24	Culvert	200+17
UT2 Reach 1	24	Culvert	308+49
UT2 Reach 1	24	Culvert	326+72
UT2 Reach 2	24	Culvert	331+40
UT2A	24	Culvert	426+20
UT3	16	Ford	603+75

11.6.2 Natural Plant Community Restoration

As a final stage of construction, riparian stream buffers and wetlands will be planted and restored with native trees and herbaceous plants representative of the natural plant community that exists within the project watershed. The natural community within and adjacent to the project easement is described in Section 5.1. The reference vegetation community is described in Section 8.1.2. The approach to woody vegetation is described in Section 10.3. The woody and herbaceous species selected are based on these community types, observations of the occurrence of species in the surrounding area, and best professional judgment on species establishment and anticipated site conditions in the early years following project implementation. Proposed tree and shrub species are primarily early successional conditions with proven records of establishment on restoration sites and are commercially available. All proposed species are detailed in the plan set.

Permanent herbaceous seed will be placed on stream banks and bench areas and all disturbed areas within the project easement. Individual tree and shrub species will be planted throughout the project easement including stream banks, benches, tops of banks, and floodplains zones. These species will be planted as bare root and live stakes and will provide additional stabilization to the outsides of constructed meander bends and side slopes. Species planted as bare roots will be planted in rows spaced twelve feet apart and running in a perpendicular manner to the valley contour. Individual trees within rows will be spaced seven feet apart for a total planting density of 520 trees per acre. Live stakes will be planted on channel banks. Point bars will not be planted with live stakes on Little Pine Creek. Targeted densities after monitoring year 3 are 320 woody stems per acre.

12.0 Maintenance Plan

The site shall be monitored on a regular basis and a physical inspection of the site shall be conducted a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Table 17. Maintenance Plan
Little Pine Creek III Stream & Wetland Restoration Project

Component/Feature	Maintenance through project close-out
Stream	Routine channel maintenance and repair activities may include chinking of in-stream structures to prevent piping, securing of loose coir matting, and supplemental installations of live stakes and other target vegetation along the channel. Areas where storm water and floodplain flows intercept the channel may also require maintenance to prevent bank failures and head-cutting. Beaver dams that inundate the streams may need to be removed.
Wetland	Routine wetland maintenance and repair activities may include supplemental installations of live stakes and other target vegetation within the wetland. Areas where floodplain flows intersect the wetland may also require maintenance to prevent scour.
Vegetation	Vegetation shall be maintained to ensure the health and vigor of the targeted community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be controlled by mechanical and/or chemical methods. Any vegetation control requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations.
Site boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis.
Ford and Culvert Crossings	Permanent crossings within the site may be maintained only as allowed by Conservation Easement or existing easement, deed restrictions, rights of way, or corridor agreements.

Any identified high priority problem areas will be visually monitored and remedial actions will be discussed with NCEEP staff to determine a plan of action. A remedial action plan will be submitted if maintenance is required.

13.0 Performance Standards

The stream restoration performance criteria for the project site will follow approved performance criteria presented in the EEP Mitigation Plan Template (version 2.1, 09/01/2011), the EEP Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation (11/7/2011), and the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWQ. Annual monitoring and bi-annual site visits will be conducted to assess the condition of the finished project. The stream restoration and enhancement sections of the project will be assigned specific performance criteria components for stream morphology, hydrology, and vegetation. The wetland enhancement sections will be assigned specific performance criteria for vegetation. Performance criteria will be evaluated throughout the five year post-construction monitoring. If all performance criteria have been successfully met and two bankfull events have occurred during separate years, there may be a proposal to terminate stream and/or vegetation monitoring. An outline of the performance criteria components follows.

13.1 Streams

13.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 2.2 for restored channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the appropriate Rosgen stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

In order to monitor the channel dimension, permanent cross-sections will be installed along riffle and pool sections in proportion to EEP guidance. Due to the stream size difference between Little Pine Creek and its tributaries, two different approaches were used to determine the number of cross-sections needed to adequately monitor channel dimension. One permanent cross-section will be installed per 20 bankfull channel widths along Little Pine Creek and two cross-sections will be installed per 1000 LF of stream restoration/enhancement reaches along the tributaries. Each cross-section will be permanently marked with pins to establish its location. Cross-section surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg. Cross-sections will be surveyed annually for the five year monitoring period.

13.1.2 Pattern and Profile

Longitudinal profile data for the stream restoration reaches should show that the bedform features are remaining stable. The riffles should be steeper and shallower than the pools, while the pools should be deep with nearly flat water surface slopes. The relative percentage of riffles and pools should not change significantly from the design parameters. Adjustments in length and slope of run and glide features are expected and will not be considered a sign of instability. The longitudinal profile should show that the bank height ratio remains very near to 1.0 for the majority of the restoration reaches.

13.1.3 Photo Documentation

Photographs will be taken once a year to visually document stability for five years following construction. Permanent markers will be established and located with GPS equipment so that the same locations and view directions on the site are photographed each year. Photos will be used to monitor stream restoration and enhancement reaches, wetland enhancement areas, as well as vegetation plots.

Longitudinal reference photos will be established at the tail of riffles approximately every 200 LF along the channel by taking a photo looking upstream and downstream. Cross-sectional photos will be taken of each permanent cross-section looking upstream and downstream. Reference photos will also be taken for each of the vegetation plots. Representative digital photos of each permanent photo point, cross-section and vegetation plot will be taken on the same day of the stream and vegetation assessments are conducted. The photographer will make every effort to consistently maintain the same area in each photo over time.

Photographs should illustrate the site's vegetation and morphological stability on an annual basis. Cross-section photos should demonstrate no excessive erosion or degradation of the banks. Longitudinal photos should indicate the absence of persistent bars within the channel or vertical incision. Grade control structures should remain stable. Deposition of sediment on the bank side of vane arms is preferable. Maintenance of scour pools on the channel side of vane arms is expected.

13.1.4 Substrate

Substrate materials in the restoration and enhancement level I reaches should indicate a progression towards or the maintenance of coarser materials in the riffle features and smaller particles in the pool features.

A reach-wide pebble count will be performed in each restoration and enhancement level I reach (Little Pine Reach 1, Little Pine Reach 2A, Little Pine Reach 2B, UT1, UT2, and UT2B) each year for classification purposes. A pebble count will be performed at each surveyed riffle to characterize the pavement during the years of the cross section survey.

13.1.5 Bankfull Events

Two bankfull flow events must be documented on the restoration and enhancement reaches within the five-year monitoring period. The two bankfull events must occur in separate years. Stream monitoring will continue until success criteria in the form of two bankfull events in separate years have been documented.

Bankfull events will be documented using a crest gage, photographs, and visual assessments such as debris lines. Five crest gages will be installed; one on Little Pine, one on UT1, one on UT2, and one on UT2B. The crest gages will be installed within a riffle cross-section of the restored channels in surveyed riffle cross-sections. The gages will be checked at each site visit to determine if a bankfull event has occurred. Photographs will be used to document the occurrence of debris lines and sediment deposition.

13.1.6 Visual Assessments

Visual assessments will be performed along all stream areas on an annual basis during the five year monitoring period. Problem areas will be noted such as channel instability (i.e. lateral and/or vertical instability, in-stream structure failure/instability and/or piping, headcuts), vegetated buffer health (i.e. low stem density, vegetation mortality, invasive species or encroachment), beaver activity, or livestock access. Areas of concern will be mapped and photographed accompanied by a written description in the annual report. Problem areas will be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report. A habitat assessment along each restoration and enhancement reach should also be conducted at the time of the visual assessments to document project uplift.

13.2 Vegetation

The final vegetative success criteria will be the survival of 210 planted stems per acre in the riparian corridor along restored and enhanced reaches and within the wetland enhancement areas at the end of the required monitoring period (year five). The interim measure of vegetative success for the site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year and at least 260 stems per acre at the end of the fifth year of monitoring. The extent of invasive species coverage will also be monitored and controlled as necessary throughout the required monitoring period (five years).

14.0 Monitoring Plan

Annual monitoring data will be reported using the EEP Monitoring Report Template (version 1.2.1, 12/01/2009). The monitoring report shall provide a project data chronology that will facilitate an understanding of project status and trends, population of EEP databases for analysis, research purposes, and assist in decision making regarding close-out. The monitoring period will extend five years beyond completion of construction or until performance criteria have been met. All survey will be tied to grid.

14.1 Site Specific Monitoring

Using the EEP Baseline Monitoring Plan Template (version 2.0, 10/14/10), a baseline monitoring document and as-built record drawings of the project will be developed within 60 days of the planting completion and monitoring installation on the restored site. As-built drawings will follow the EEP Format, Data Requirements, and Content Guidance For Digital Drawings Submitted to EEP (version 1.0, 03/27/08). Monitoring reports will be prepared in the fall of each year of monitoring and submitted to EEP. These reports will be based on the EEP Monitoring Report Template (version 1.2.1, 12/01/2009). The monitoring period will extend five years beyond completion of construction or until performance criteria have been met per the criteria stated in the EEP Mitigation Plan Template (version 1.0, 11/20/2009) and the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWQ. Project monitoring requirements are listed in more detail in Tables 18a-b.

Table 18a. Monitoring Requirements (R and EI Reaches)
Little Pine Creek III Stream & Wetland Restoration Project

Parameter	Monitoring Feature	Quantity/ Length by Reach					Frequency	Notes
		Little Pine Reach 1	Little Pine Reach 2A	Little Pine Reach 2B	UT2	UT2B downstream		
Dimension	Riffle Cross Sections	2	2	2	4	1	Annual	1
	Pool Cross Section	1	1	1	3	1		
Pattern	Pattern	n/a	n/a	n/a	n/a	n/a	n/a	2
Profile	Longitudinal Profile	Y	Y	Y	Y	Y	Annual	
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count	1 RW, 1 RF	1 RW, 1 RF	1 RW, 1 RF	1 RW, 3 RF	1 RW, 1 RF	Annual	
Hydrology	Crest Gage	Y	Y	Y	Y	Y	Annual	3
Vegetation	Vegetation Plots	6	6	5	8	1	Annual	4
Visual Assessment	All Streams	Y	Y	Y	Y	Y	Annual	
Exotic and nuisance vegetation							Annual	5
Project Boundary							Annual	6
Reference Photos	Photos	7	5	5	11	1	Annual	7

Notes:

1. Cross-sections will be permanently marked with rebar to establish location. Surveys will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg. The number of cross-sections proposed was established using 1 cross-section per 20 bankfull widths for Little Pine Creek and 2 cross-sections per 1,000 LF along the tributaries since the streams are smaller.
2. Entire profile will be surveyed on an annual basis for restoration and enhancement level 1 streams since the proposed stream lengths are less than 3000 LF.
3. One crest gage will be installed along each reach. Where there is more than one approach applied to a reach, the crest gage will be installed in a central location to capture bankfull events for both design approaches. Device will be inspected quarterly or semi-annually, evidence of bankfull will be documented with a photo.
4. Vegetation monitoring will follow CVS Level 2 protocol.
5. Locations of exotic and nuisance vegetation will be recorded using a GPS and mapped.
6. Locations of fence damage, vegetation damage, boundary encroachments, etc. will be recorded using a GPS and mapped.
7. Markers will be established and recorded using a GPS so that the same locations and view directions on the site are monitored.

Table 18b. Monitoring Requirements (EII Reaches)
Little Pine Creek III Stream & Wetland Restoration Project

Parameter	Monitoring Feature	Quantity/ Length by Reach				Frequency	Notes
		UT1	UT2A	UT2B - upstream	Wetlands		
Dimension	Riffle Cross Sections	n/a	n/a	n/a	n/a	n/a	
	Pool Cross Section	n/a	n/a	n/a	n/a	n/a	
Pattern	Pattern	n/a	n/a	n/a	n/a	n/a	
Profile	Longitudinal Profile	n/a	n/a	n/a	n/a	n/a	
Substrate	Reach wide (RW), Riffle (RF) 100 pebble count	n/a	n/a	n/a	n/a	n/a	
Hydrology	Crest Gage	Y	Y	Y	n/a	Annual	1
Vegetation	Vegetation Plots	5	2	1	9	Annual	2
Visual Assessment	All Streams	Y	Y	Y	Y	Annual	
Exotic and nuisance vegetation						Annual	3
Project Boundary						Annual	4
Reference Photos	Photos	5	6	2	n/a	Annual	5

Notes:

1. One crest gage will be installed along each reach. Where there is more than one approach applied to a reach, the crest gage will be installed in a central location to capture bankfull events for both design approaches. Device will be inspected quarterly or semi-annually, evidence of bankfull will be documented with a photo.
2. Vegetation monitoring will follow CVS Level 2 protocol.
3. Locations of exotic and nuisance vegetation will be recorded using a GPS and mapped.
4. Locations of fence damage, vegetation damage, boundary encroachments, etc. will be recorded using a GPS and mapped.
5. Markers will be established and recorded using a GPS so that the same locations and view directions on the site are monitored.

14.2 Additional Monitoring Details

Vegetation

Vegetation monitoring plots will be installed and evaluated within the restoration and enhancement areas to measure the survival of the planted trees. The number of monitoring quadrants required is based on the EEP monitoring guidance documents (version 1.4, 11/7/11). The size of individual quadrants will be 100 square meters for woody tree species and shrubs. Vegetation assessments will be conducted following the Carolina Vegetation Survey (CVS) Level 2 Protocol for Recording Vegetation (2006).

The initial baseline survey will be conducted within 21 days from completion of site planting and used for subsequent monitoring year comparisons. The first annual vegetation monitoring activities will commence at the end of the first growing season, during the month of September. The restoration and enhancement areas will then be evaluated each subsequent year between June 1 and September 31. Species composition, density, and survival rates will be evaluated on an annual basis by plot and for the entire site. Individual plot data will be provided and will include diameter, height, density, vigor, damage (if any), and survival. Planted woody stems will be marked annually as needed and given a coordinate, based off of a known origin, so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year's living planted stems and the current year's living planted stems.

15.0 Long-Term Management Plan

Upon approval for close-out by the Interagency Review Team (IRT) the site will be transferred to the NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program. This party shall be responsible for periodic inspection of the site to ensure that restrictions required in the conservation easement or the deed restriction document(s) are upheld. Endowment funds required to uphold easement and deed restrictions shall be negotiated prior to site transfer to the responsible party.

The NCDENR Division of Natural Resource Planning and Conservation's Stewardship Program currently houses EEP stewardship endowments within the non-reverting, interest-bearing Conservation Lands Stewardship Endowment Account. The use of funds from the Endowment Account is governed by North Carolina General Statue GS 113A-232(d)(3). Interest gained by the endowment fund may be used only for the purpose of stewardship, monitoring, stewardship administration, and land transaction costs, if applicable. The NCDENR Stewardship Program intends to manage the account as a non-wasting endowment. Only interest generated from the endowment funds will be used to steward the compensatory mitigation sites. Interest funds not used for those purposes will be re-invested in the Endowment Account to offset losses due to inflation.

16.0 Adaptive Management Plan

Upon completion of site construction EEP will implement the post-construction monitoring protocols previously defined in this document. Project maintenance will be performed as described previously in this document. If, during the course of annual monitoring it is determined the site's ability to achieve site performance standards are jeopardized, EEP will notify the USACE of the need to develop a Plan of Corrective Action. The Plan of Corrective Action may be prepared using in-house technical staff or may require engineering and consulting services. Once the Corrective Action Plan is prepared and finalized EEP will:

- Notify the USACE as required by the Nationwide 27 permit general conditions.
- Revise performance standards, maintenance requirements, and monitoring requirements as necessary and/or required by the USACE.
- Obtain other permits as necessary.
- Implement the Corrective Action Plan.
- Provide the USACE a Record Drawing of Corrective Actions. This document shall depict the extent and nature of the work performed.

17.0 Financial Assurances

Pursuant to Section IV H and Appendix III of the Ecosystem Enhancement Program's In-Lieu Fee Instrument dated July 28, 2010, the North Carolina Department of Environment and Natural Resources has provided the US Army Corps of Engineers Wilmington District with a formal commitment to fund projects to satisfy mitigation requirements assumed by EEP. This commitment provides financial assurance for all mitigation projects implemented by the program.

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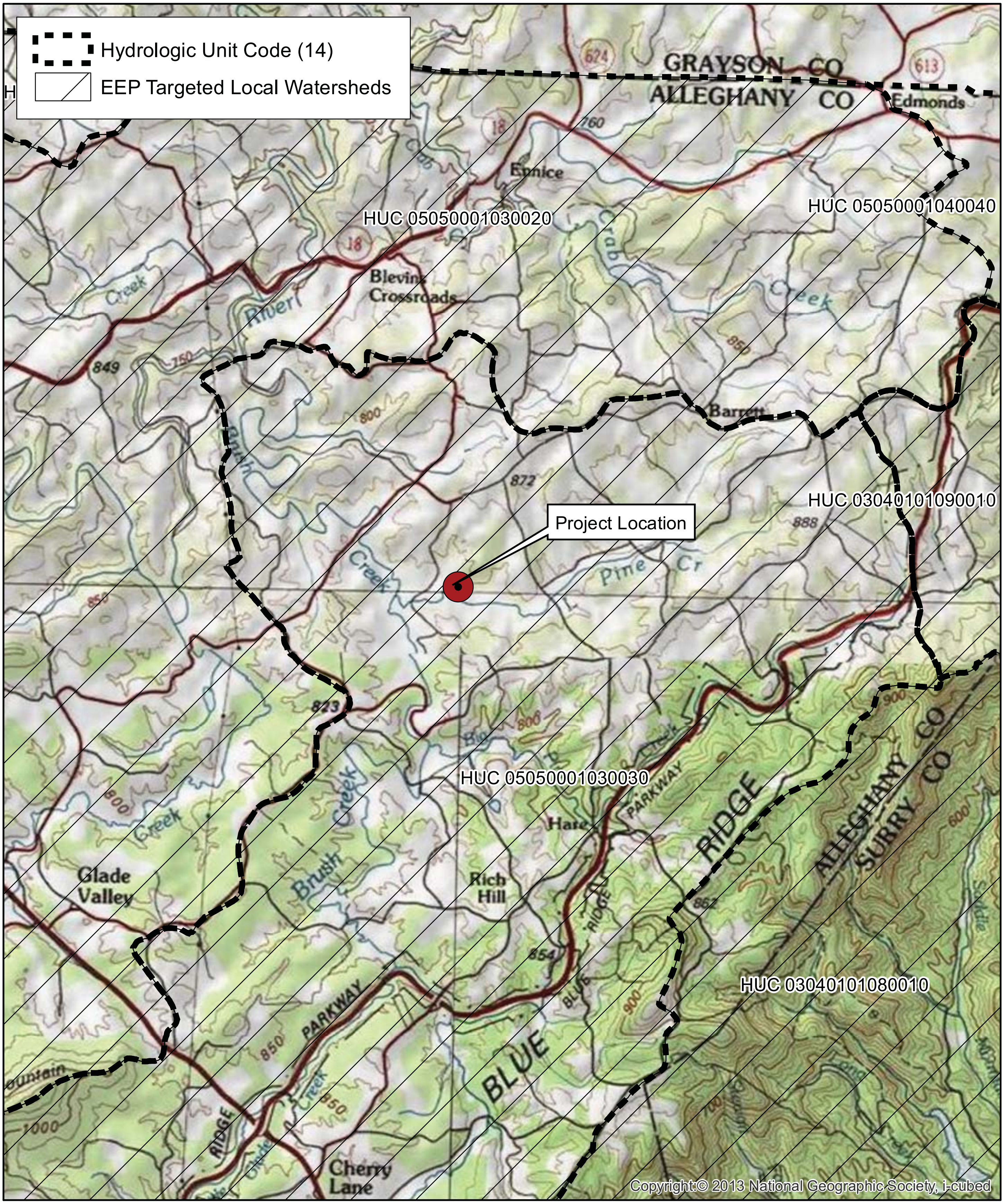
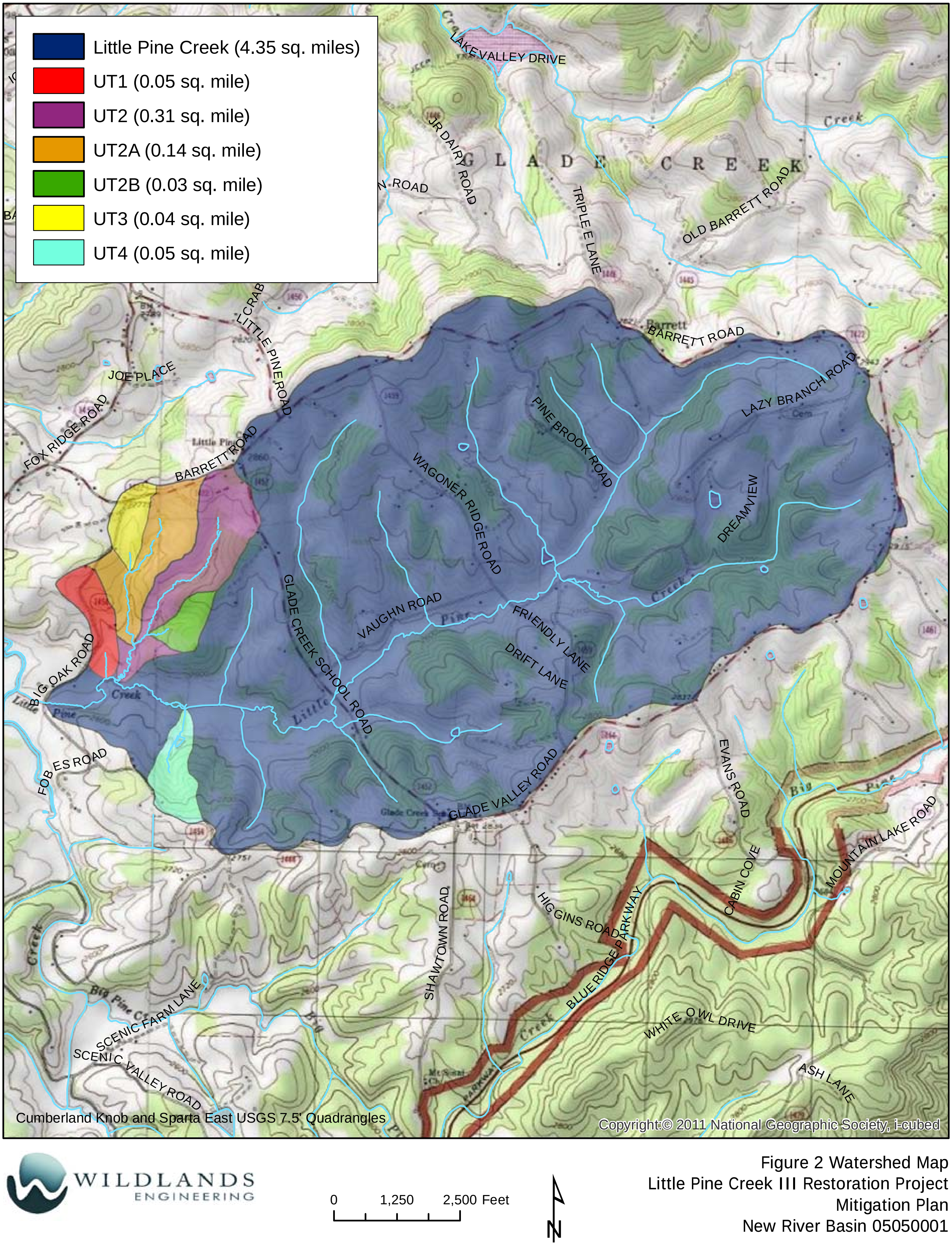


WILDLANDS ENGINEERING

0 0.5 1 Miles

N

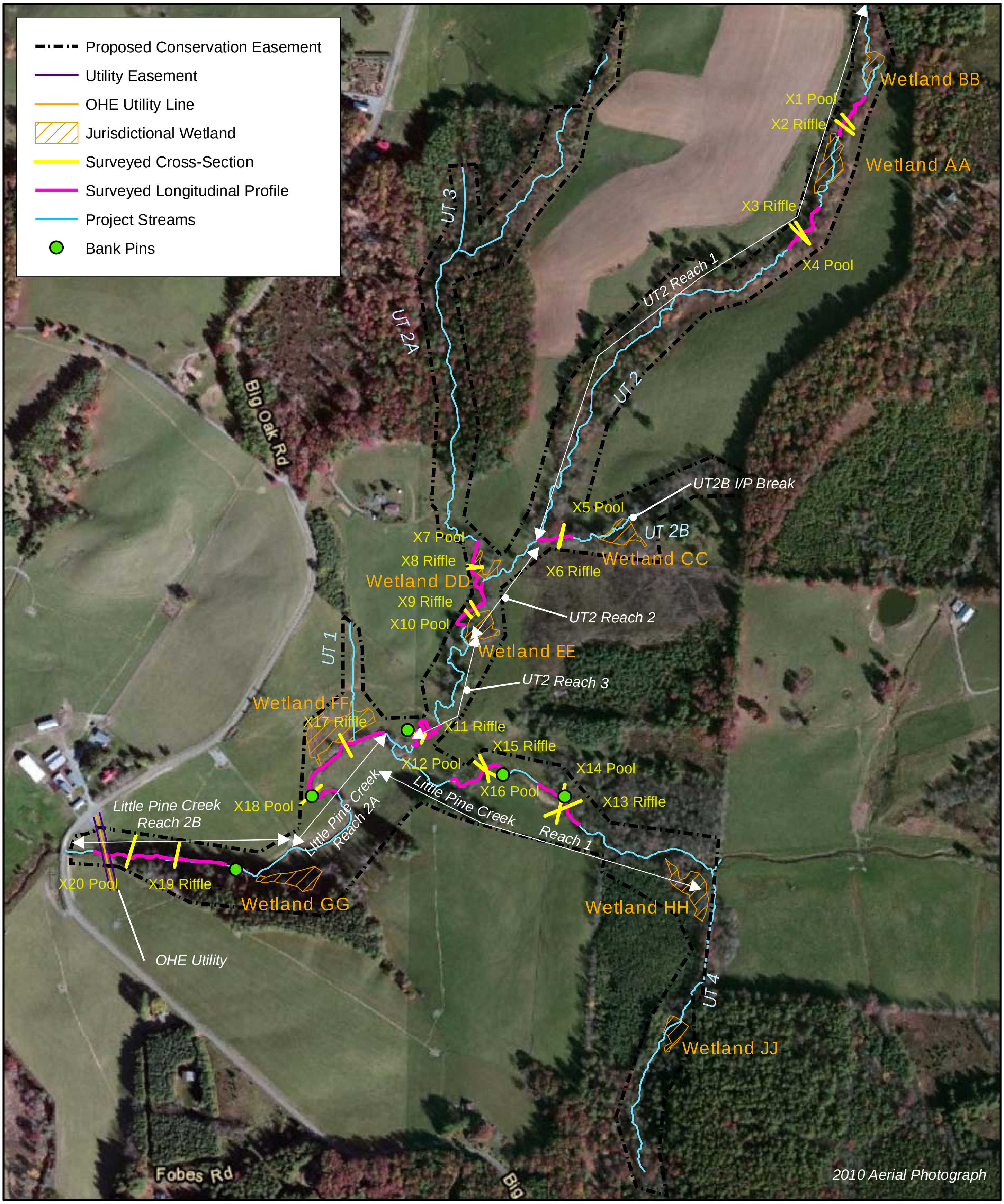
Figure 1 Vicinity Map
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin (05050001)
Alleghany County, NC



WILDLANDS ENGINEERING

Figure 2 Watershed Map
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin 05050001

Alleghany County, NC



WILDLANDS ENGINEERING

0 287.5 575 Feet

N

Figure 3 Site Existing Conditions Map
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin 05050001

Alleghany County, NC

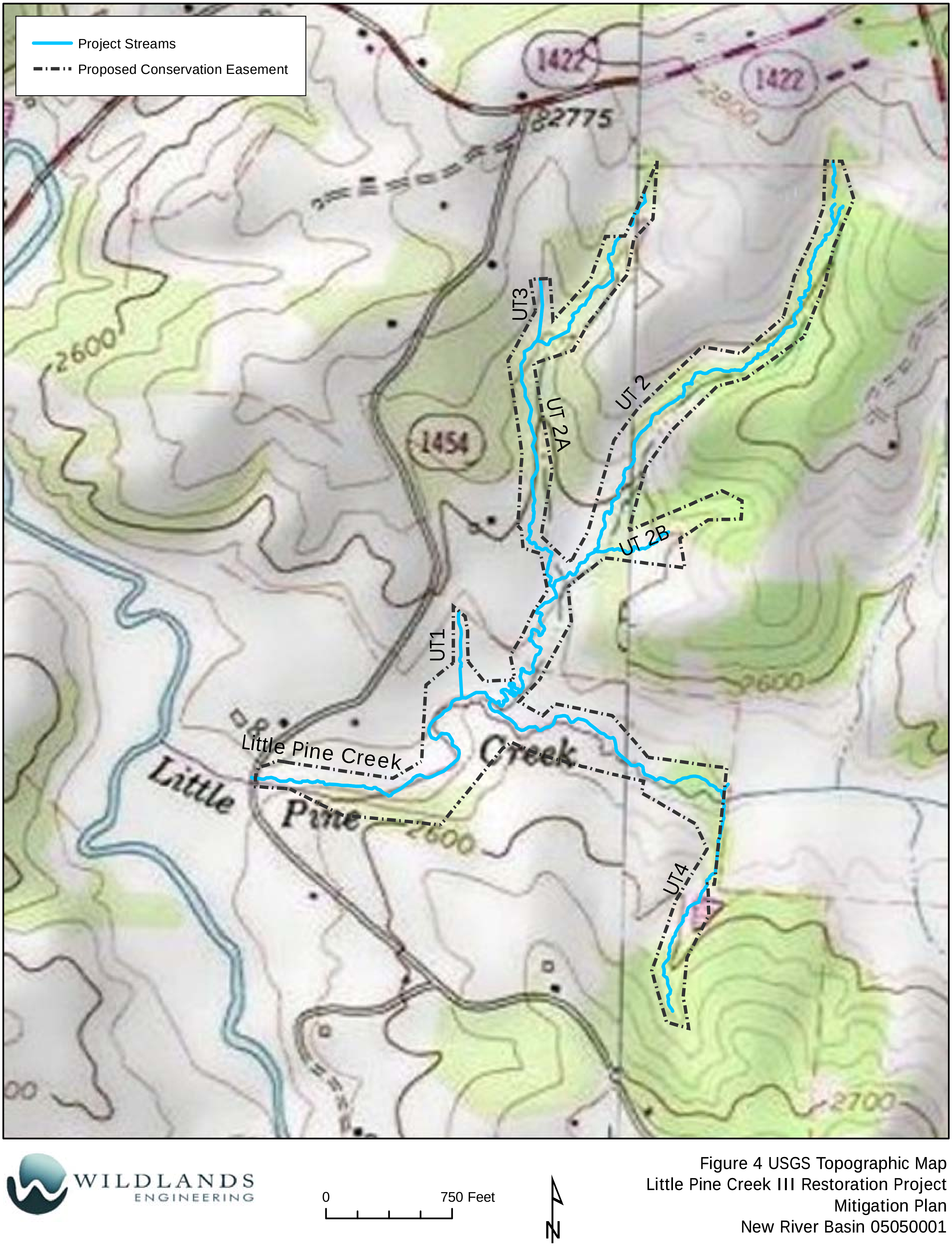
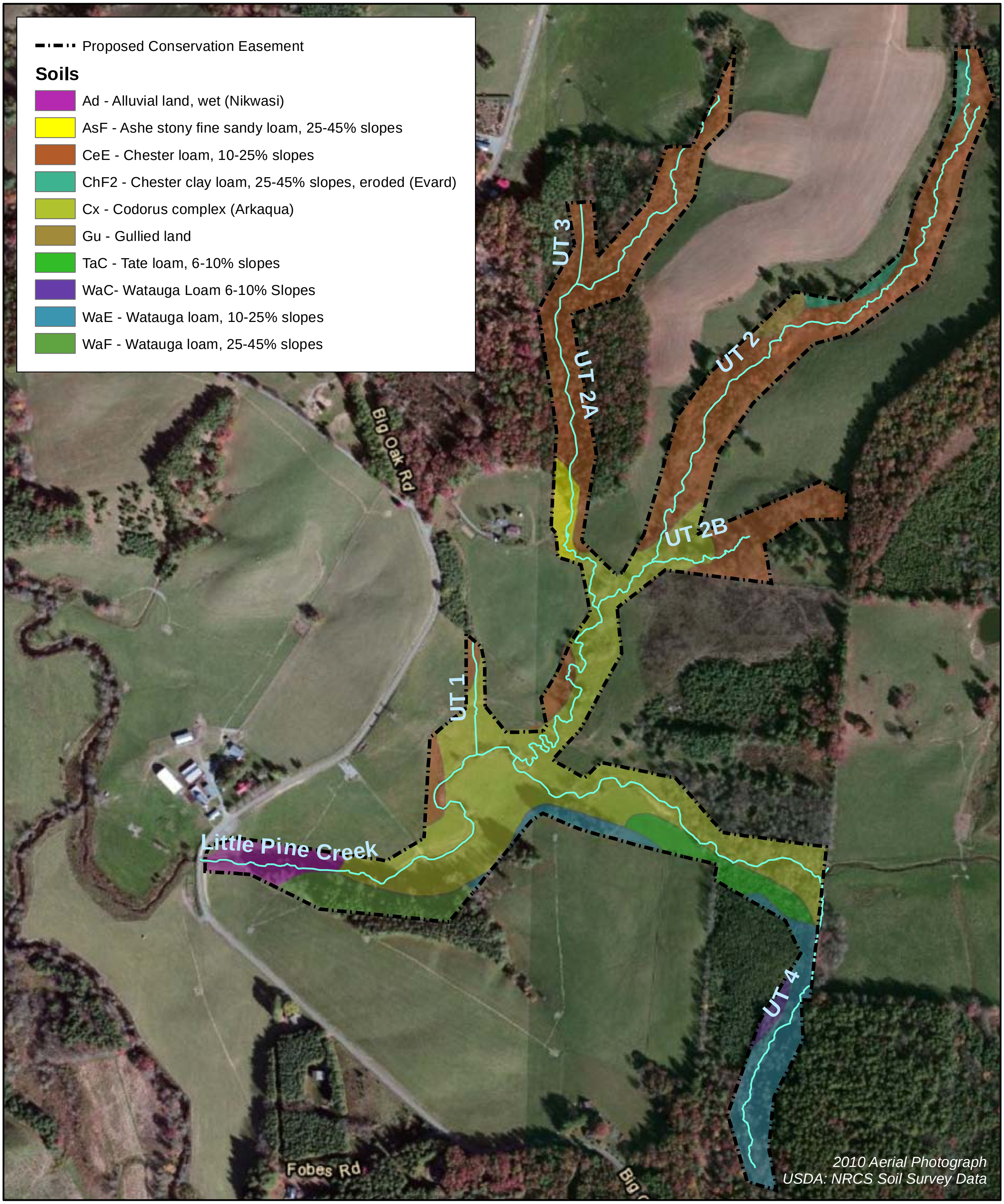


Figure 4 USGS Topographic Map
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin 05050001

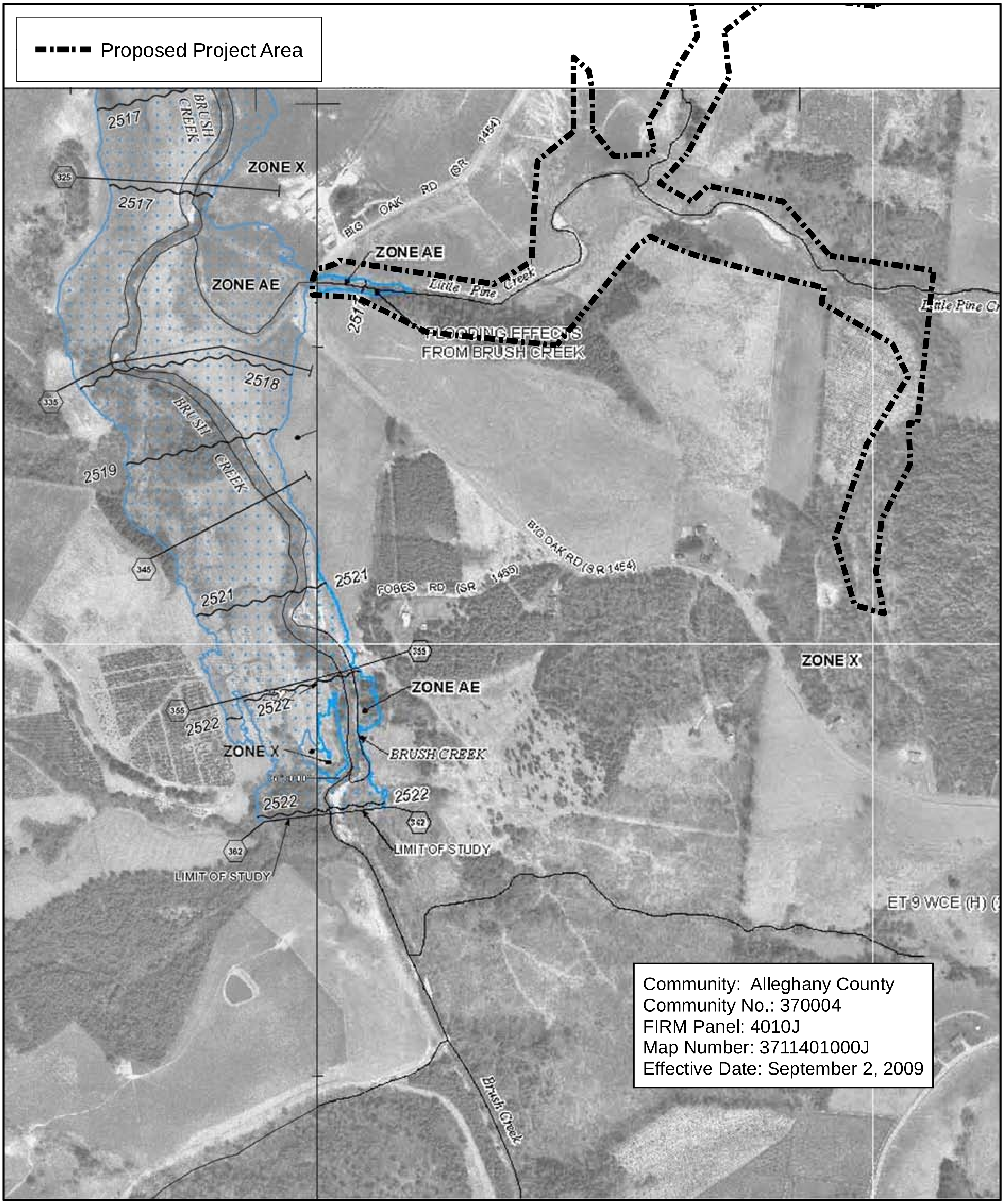
Alleghany County, NC



WILDLANDS ENGINEERING

Figure 5 Site Soil Survey
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin 05050001

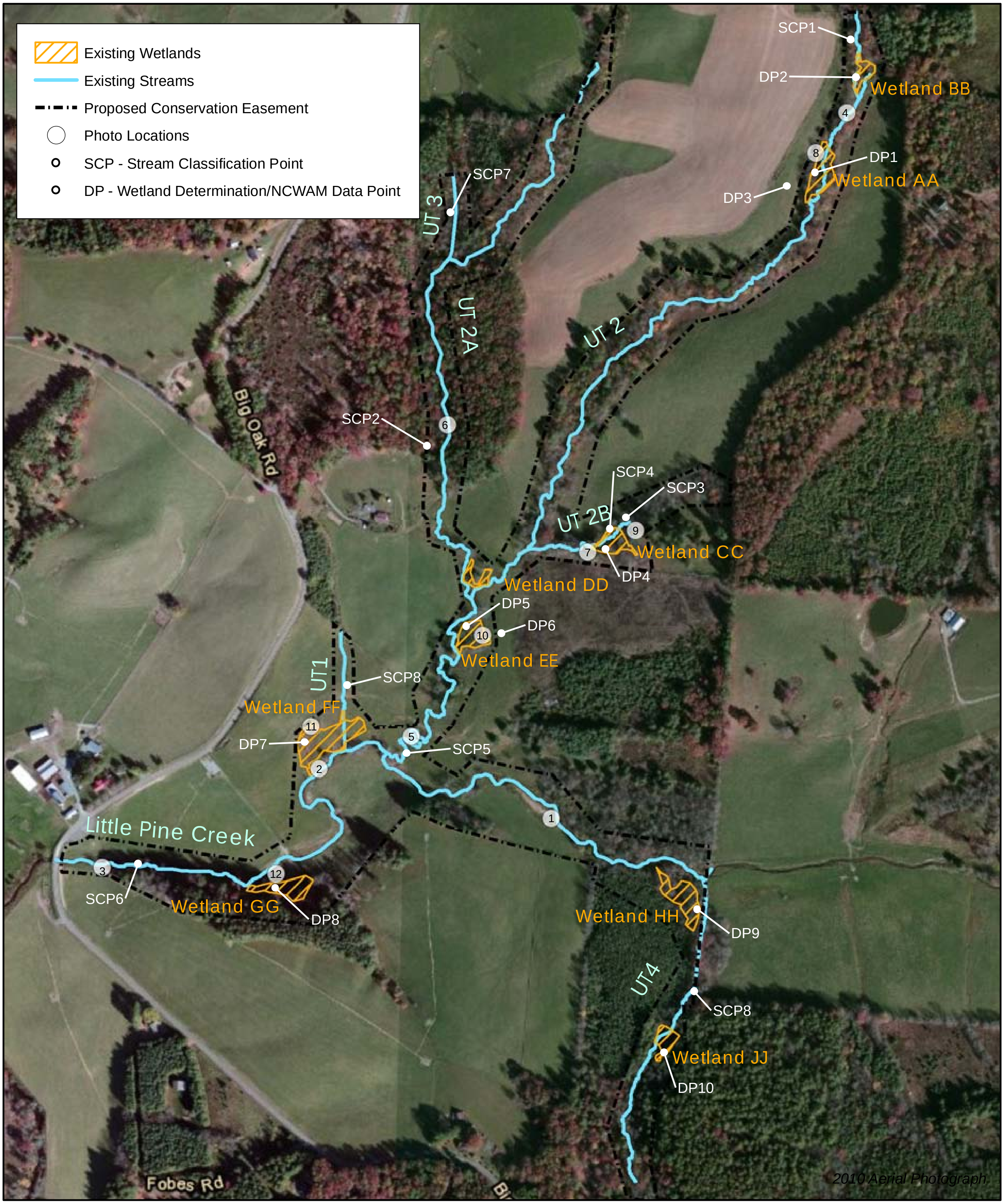
Alleghany County, NC



WILDLANDS ENGINEERING

Figure 6 FEMA Flood Map
Little Pine Creek III Restoration Project
Conceptual Plan
New River Basin 05050001

Alleghany County, NC



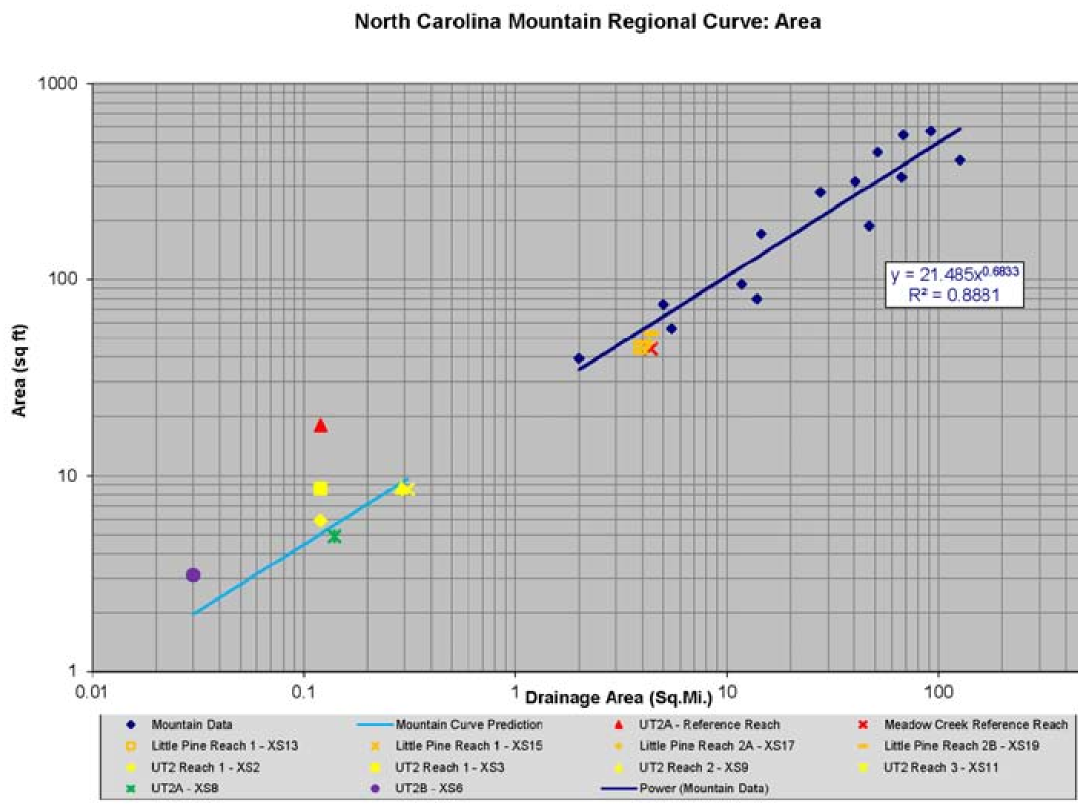
WILDLANDS ENGINEERING

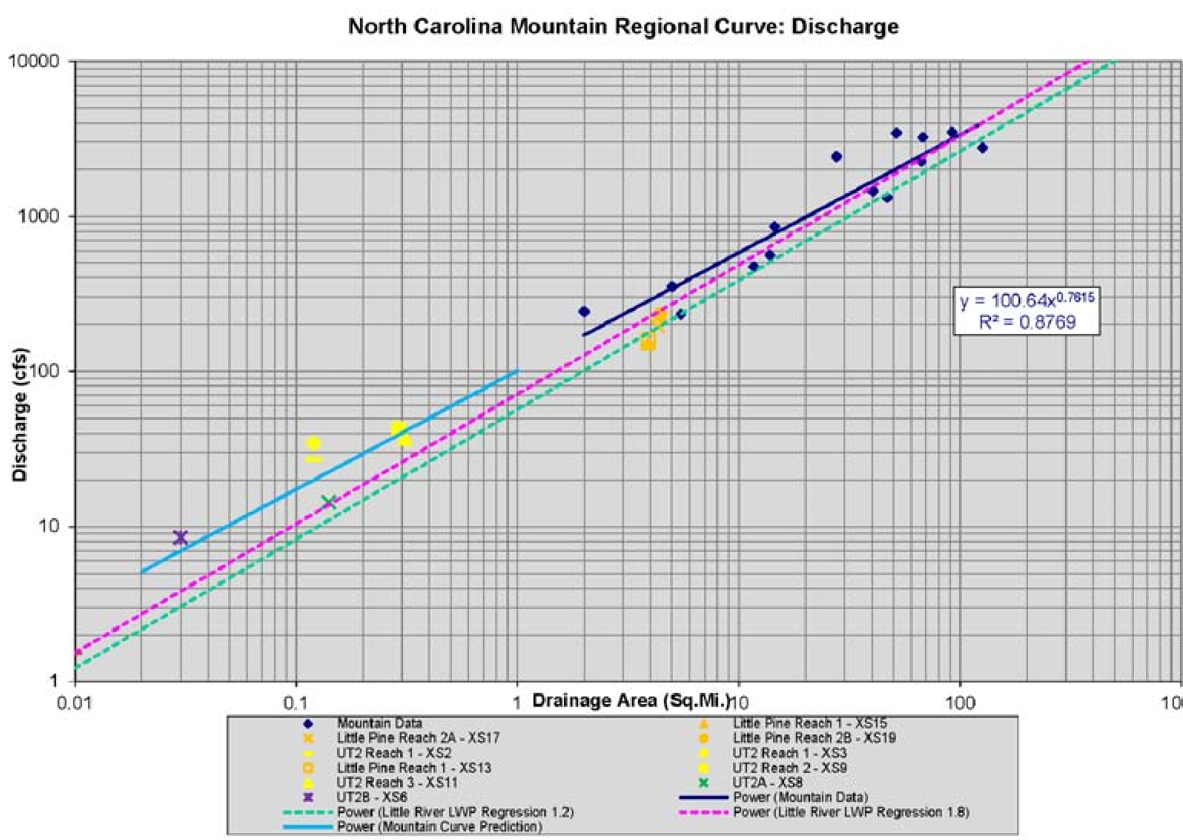
0 287.5 575 Feet

N

Figure 7 Hydrologic Features Map
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin 05050001

Alleghany County, NC

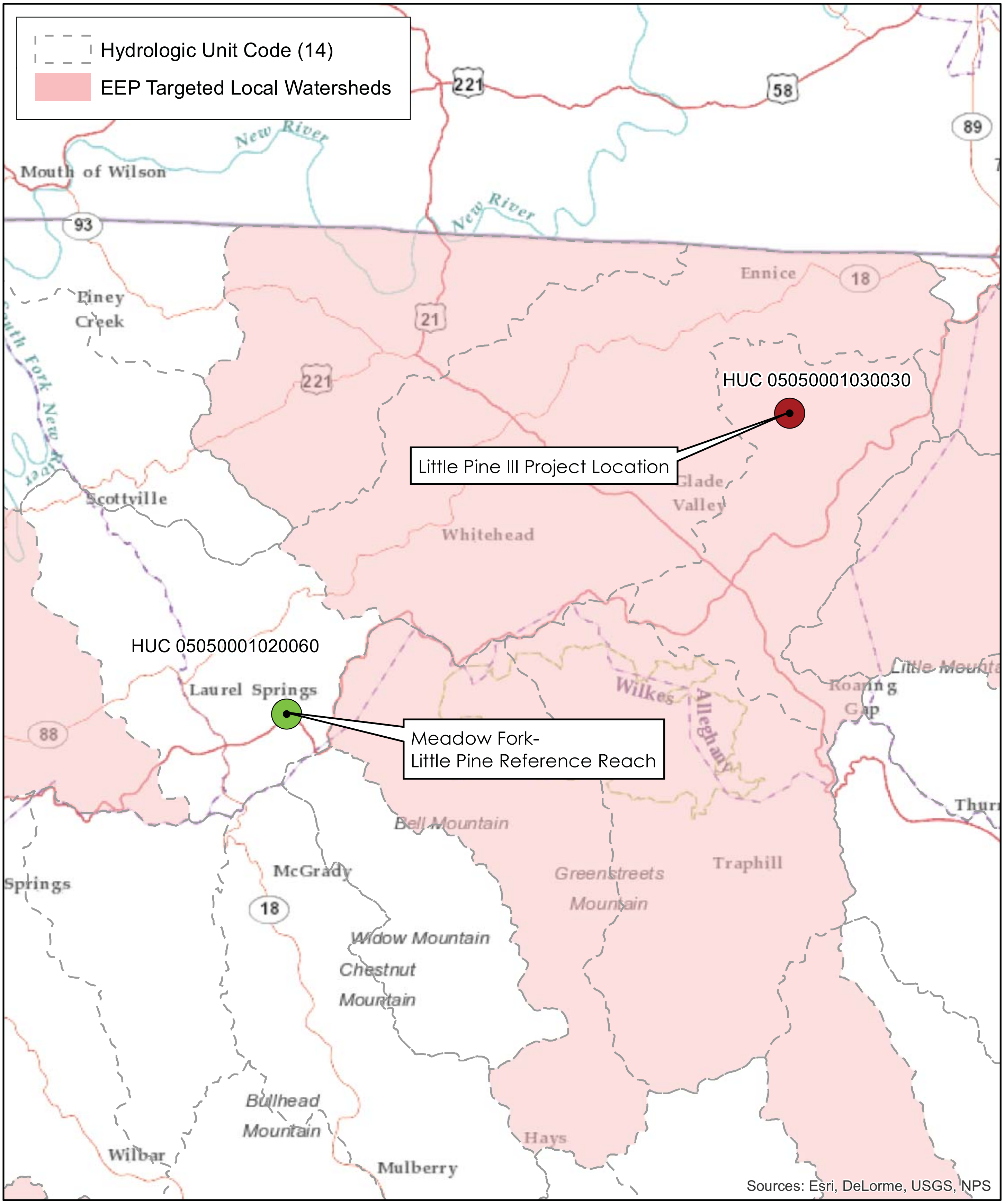




WILDLANDS ENGINEERING

Figure 8 NC Piedmont Regional Curves
with Project Data Overlay
Little Pine Creek III Restoration Project
New River Basin (05050001)

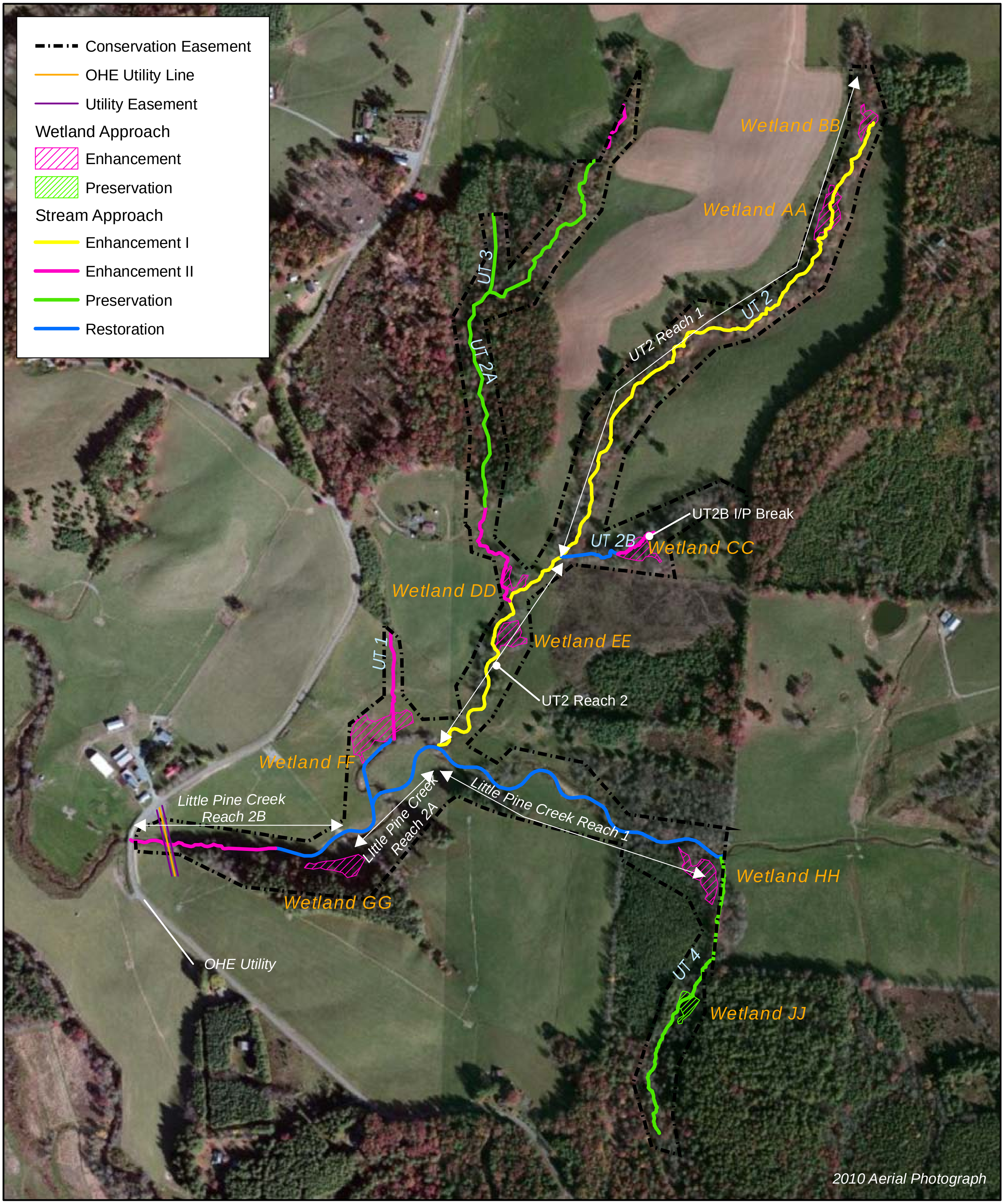
Alleghany County, NC



WILDLANDS ENGINEERING

Figure 9 Reference Reach Vicinity Map
Mitigation Plan
New River Basin 05050001

Alleghany County, NC



WILDLANDS ENGINEERING

0 325 650 Feet

N

Figure 10 Concept Design
Little Pine Creek III Restoration Project
Mitigation Plan
New River Basin 05050001

Alleghany County, NC

APPENDIX 1. Project Site Photographs

Little Pine, Reach 1 – bank erosion through wooded parcel

Little Pine, Reach 1 – bank erosion on pastured parcel

Little Pine, Reach 1 – reinstallation of bank pins on left bank

Little Pine, Reach 1 – erosion in meander bend

View of Little Pine Creek Reach 1, facing upstream. (Photo 1 – Figure 7)

Left bank of Little Pine at UT2 confluence

Little Pine, Reach 2A – Wetland FF in the right floodplain

Little Pine, Reach 2A – view of right bank at tortuous meander bend

View of Little Pine Creek Reach 2A, facing downstream at the tortuous meander. (Photo 2 – Figure 7)

Little Pine, Reach 2B – confined against left valley wall

Little Pine, Reach 2B – cattle in stream

View of Little Pine Creek Reach 2, facing upstream near Big Oak Road. (Photo 3 – Figure 7)

View of UT2 Reach 1 facing upstream. (Photo 4 – Figure 7)

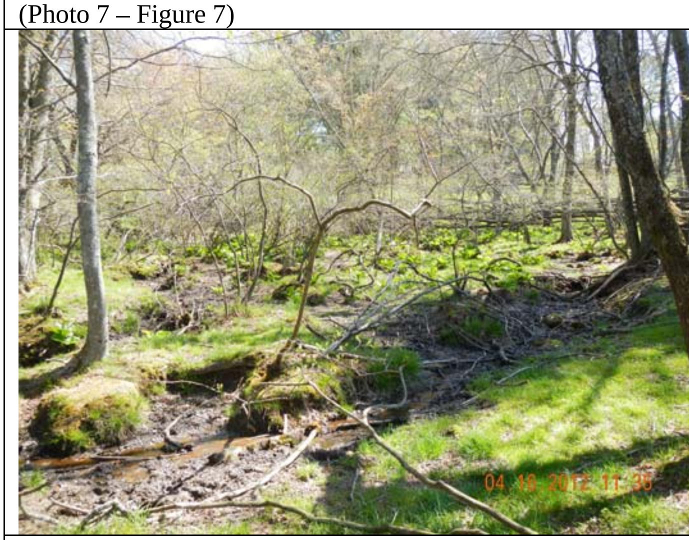

View of highly sinuous section of UT2 Reach 3, facing upstream. (Photo 5 – Figure 7)


UT2, Reach 3 - tortuous meander geometry


UT2 and Little Pine confluence


UT2, Reach 3 – bank erosion and wetland seep


UT2, Reach 3 - headcut

	
UT2A, upstream reach – debris piled in channel, cattle in field	View of stable channel dimensions on UT2A, facing downstream. (Photo 6 – Figure 7)
	
View of perennial portion of UT2B, facing downstream. (Photo 7 – Figure 7)	View of trampled vegetation in Wetland AA, facing east towards UT2. (Photo 8 – Figure 7)
 	
View of Wetland CC, facing northeast from confluence with UT2B. (Photo 9 – Figure 7)	View of Wetlands DD and EE, facing west towards UT2. (Photo 10 – Figure 7)

	
View of Wetland FF in the floodplain of Little Pine Creek, facing east. (Photo 11 – Figure 7)	View of Wetland GG in the floodplain of Little Pine Creek, facing south. (Photo 12 – Figure 7)

APPENDIX 2. Project Site USACE Routine Wetland Determination Data Forms and Jurisdictional Determination

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP1

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): valley hillslope Local relief (concave, convex, none): concave Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.515979 Long: W 80.995867 Datum: ____

Soil Map Unit Name: Chester loam (CeE) NWI classification: R3UB1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ____	**Is the Sampled Area within a Wetland?** **Yes** ✔ **No** ____
Hydric Soil Present?	Yes ✔ No ____	
Wetland Hydrology Present?	Yes ✔ No ____	

Remarks:

Sampling point is representative of a jurisdictional wetland area located in the valley floor, along a portion of UT2. Site is an active cattle pasture with mature riparian tree species.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ✔ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ✔ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔ No ____	Depth (inches): 1-3"	
Water Table Present?	Yes ✔ No ____	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔ No ____	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✔ **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP1

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	40	Yes	FAC
2. Platanus occidentalis	10	Yes	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	50 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Lindera benzoin	10	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	10 = Total Cover		

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus strigosus	50	Yes	FACW
2. Symplocarpus foetidus	20	Yes	OBL
3. Impatiens capensis	5	No	FACW
4. Juncus effusus	5	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	80 = Total Cover		

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
✔ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a narrow riparian area with mature tree species, located within an active cattle pasture.

SOIL

Sampling Point: DP1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1	90	7.5YR 5/6	10	C	PL	sandy silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? **Yes** ✔ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP2

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): valley hillslope Local relief (concave, convex, none): concave Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.515979 Long: W 80.995867 Datum: ______

Soil Map Unit Name: Chester loam (CeE) NWI classification: R3UB1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ____	**Is the Sampled Area within a Wetland?**	**Yes ✔ No ____**
Hydric Soil Present?	Yes ✔ No ____		
Wetland Hydrology Present?	Yes ✔ No ____		

Remarks:

Sampling point is representative of a jurisdictional wetland area located in the valley floor, along a portion of UT2. Site is an active cattle pasture with mature riparian tree species.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ✔ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔ No ____	Depth (inches): 1-2"	
Water Table Present?	Yes ✔ No ____	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔ No ____	Depth (inches): <12"	**Wetland Hydrology Present? Yes ✔ No ____**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants. Sampling Point: DP2

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	60	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	60 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		

Herb Stratum (Plot size: 5')			
1. Cyperus strigosus	70	Yes	FACW
2. Impatiens capensis	10	No	FACW
3. Juncus effusus	5	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85 = Total Cover		

Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a narrow riparian area with mature tree species, located within an active cattle pasture.

SOIL

Sampling Point: DP2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1	80	7.5YR 4/6	20	C	PL	sandy silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✔ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP3

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): valley hillslope Local relief (concave, convex, none): none Slope (%): 2%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.515979 Long: W 80.995867 Datum: ______

Soil Map Unit Name: Chester loam (CeE) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔	No ___	**Is the Sampled Area within a Wetland?** Yes ___ No ✔
Hydric Soil Present?	Yes ___	No ✔	
Wetland Hydrology Present?	Yes ___	No ✔	

Remarks:

Sampling point is representative of a non-jurisdictional upland area located on a valley sideslope, along a portion of UT2. Site is an active cattle pasture.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ___	No ✔	Depth (inches): ______
Water Table Present?	Yes ___	No ✔	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ___	No ✔	Depth (inches): ______

Wetland Hydrology Present? Yes ___ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP3

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	10	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	10 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	= Total Cover		
Herb Stratum (Plot size: 5')			
1. Festuca spp.	80	Yes	-
2. Ranunculus bulbosus	20	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is an active cattle pasture.

SOIL

Sampling Point: DP3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5YR 4/3	95	10YR 4/2	5	D	M	silt loam	
4-12	7.5YR 4/6	100					sandy clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** ______ **No** ✔

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP4

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): concave Slope (%): 2%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.510428 Long: W 80.998879 Datum: ______

Soil Map Unit Name: Chester loam (CeE) NWI classification: R3UB1

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ______	**Is the Sampled Area within a Wetland?** **Yes** ✔ **No** ______
Hydric Soil Present?	Yes ✔ No ______	
Wetland Hydrology Present?	Yes ✔ No ______	

Remarks:

Sampling point is representative of a jurisdictional wetland area located within a valley, at the upper portion of UT2B. Site is an active cattle pasture with mature riparian tree species.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ✔ Water Marks (B1)
- ✔ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ✔ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______	No ✔	Depth (inches): ______	
Water Table Present?	Yes ✔	No ______	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔	No ______	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✔ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP4

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	70	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15')	Absolute % Cover	Dominant Species?	Indicator Status
1. Lindera benzoin	30	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	30	= Total Cover	

Herb Stratum (Plot size: 5')	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus strigosus	50	Yes	FACW
2. Symplocarpus foetidus	30	Yes	OBL
3. Impatiens capensis	10	No	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	= Total Cover	

Woody Vine Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
✔ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a small riparian area with mature tree species, located within an active cattle pasture.

SOIL

Sampling Point: DP4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1	90	5YR 4/4	10	C	PL	sandy silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ✔ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP5

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0-1%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.507506 Long: W 81.002262 Datum: ______

Soil Map Unit Name: Codorus complex (Cx) NWI classification: R2EM2

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ______	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ______
Hydric Soil Present?	Yes ✔ No ______		
Wetland Hydrology Present?	Yes ✔ No ______		

Remarks:

Sampling point is representative of a jurisdictional wetland area located within an active cattle pasture.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ✔ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______ No ✔	Depth (inches): ______	
Water Table Present?	Yes ✔ No ______	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔ No ______	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✔ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP5

Tree Stratum (Plot size: 30')

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Acer rubrum	10	Yes	FAC
2.				
3.				
4.				
5.				
6.				
7.				
8.				
		10 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
		30 = Total Cover		

Herb Stratum (Plot size: 5')

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.	Festuca spp.	60	Yes	-
2.	Juncus effusus	20	Yes	FACW
3.	Symplocarpus foetidus	10	No	OBL
4.	Polygonum pensylvanicum	10	No	FACW
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
		100 = Total Cover		

Woody Vine Stratum (Plot size: 30')

#	Species	Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
		0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

✔ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a located in the floodplain of lower UT2, within an active cattle pasture.

SOIL

Sampling Point: DP5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	90	7.5YR 4/6	10	C	PL	silt loam	
3-12	10YR 4/2	80	7.5YR 4/6	20	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? **Yes** ✔ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP6

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): valley bottom Local relief (concave, convex, none): none Slope (%): 2%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.515979 Long: W 80.995867 Datum: ______

Soil Map Unit Name: Codorus complex (Cx) NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ______	No ✔	**Is the Sampled Area within a Wetland?**	**Yes ______ No ✔**
Hydric Soil Present?	Yes ______	No ✔		
Wetland Hydrology Present?	Yes ______	No ✔		

Remarks:

Sampling point is representative of a non-jurisdictional upland area located on a valley sideslope, along a portion of UT2. Site is an active cattle pasture.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ______	No ✔	Depth (inches): ______
Water Table Present?	Yes ______	No ✔	Depth (inches): ______
Saturation Present? (includes capillary fringe)	Yes ______	No ✔	Depth (inches): ______

Wetland Hydrology Present? Yes ______ No ✔

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP6

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
= Total Cover			

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Festuca spp.	80	Yes	-
2. Trifolium repens	20	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
= Total Cover	100		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
= Total Cover	0		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ___ **No** ✔

Remarks: (Include photo numbers here or on a separate sheet.)

Site is an active cattle pasture.

SOIL

Sampling Point: DP6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/	100					sandy silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Stratified Layers (A5)
___ 2 cm Muck (A10) **(LRR N)**
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Dark Surface (S7)
___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
___ Thin Dark Surface (S9) **(MLRA 147, 148)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)
___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
___ Umbric Surface (F13) **(MLRA 136, 122)**
___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10) **(MLRA 147)**
___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ________

Depth (inches): ________

Hydric Soil Present? **Yes** ______ **No** ✔

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP7

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.507506 Long: W 81.002262 Datum: ____

Soil Map Unit Name: Codorus complex (Cx) NWI classification: R2EM2

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ____	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ____
Hydric Soil Present?	Yes ✔ No ____		
Wetland Hydrology Present?	Yes ✔ No ____		

Remarks:

Sampling point is representative of a jurisdictional wetland area located within an active cattle pasture in the floodplain of Little Pine Creek.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ___ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ✔ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ✔ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✔ No ____ Depth (inches): 2-4"

Water Table Present? Yes ✔ No ____ Depth (inches): <12"

Saturation Present? (includes capillary fringe) Yes ✔ No ____ Depth (inches): <12"

Wetland Hydrology Present? Yes ✔ **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP7

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	30	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Cyperus strigosus	90	Yes	FACW
2. Juncus effusus	10	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a located in the floodplain of Little Pine Creek, within a regularly maintained active cattle pasture.

SOIL

Sampling Point: DP7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	7.5YR 4/3						sandy silt loam	
2-12	10YR 3/1	90	7.5YR 4/4	10	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✔ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 5/10/12

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP8

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.507506 Long: W 81.002262 Datum: ____

Soil Map Unit Name: Codorus complex (Cx) NWI classification: R2EM2

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ____ (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ____	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ____
Hydric Soil Present?	Yes ✔ No ____		
Wetland Hydrology Present?	Yes ✔ No ____		

Remarks:

Sampling point is representative of a jurisdictional wetland area located within an active cattle pasture in the floodplain of Little Pine Creek.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ✔ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ✔ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔ No ____	Depth (inches): 2-6"	
Water Table Present?	Yes ✔ No ____	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔ No ____	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✔ **No** ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP8

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
		= Total Cover	
Sapling/Shrub Stratum (Plot size: 15')			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	30	= Total Cover	
Herb Stratum (Plot size: 5')			
1. Cyperus strigosus	50	Yes	FACW
2. Symplocarpus foetidus	30	Yes	OBL
3. Festuca spp.	10	No	-
4. Juncus effusus	10	No	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	0	= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ______

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a located in the floodplain of Little Pine Creek, within a regularly maintained active cattle pasture.

SOIL

Sampling Point: DP8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/1	80	7.5YR 4/6	20	C	PL	silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✔ **No** ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 1/21/13

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP9

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): floodplain Local relief (concave, convex, none): none Slope (%): 0.5%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.507506 Long: W 81.002262 Datum: ______

Soil Map Unit Name: Codorus complex (Cx) NWI classification: R2EM2

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ______	**Is the Sampled Area within a Wetland?**	**Yes** ✔ **No** ______
Hydric Soil Present?	Yes ✔ No ______		
Wetland Hydrology Present?	Yes ✔ No ______		

Remarks:

Sampling point is representative of a jurisdictional wetland area located within the floodplain of Little Pine Creek.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ✔ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔ No ______	Depth (inches): 2-4"	
Water Table Present?	Yes ✔ No ______	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔ No ______	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✔ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP9

Tree Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	50	Yes	FAC
2. Cornus amomum	10	No	FACW
3.			
4.			
5.			
6.			
7.			
8.			
	60 = Total Cover		

Sapling/Shrub Stratum (Plot size: 15')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus serrulata	30	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	30 = Total Cover		

Herb Stratum (Plot size: 5')

	Absolute % Cover	Dominant Species?	Indicator Status
1. Cyperus strigosus	40	Yes	FACW
2. Juncus effusus	30	Yes	FACW
3. Microstegium vimineum	25	Yes	FAC
4. Symplocarpus foetidus	5	No	OBL
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		

Woody Vine Stratum (Plot size: 30')

	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species		x 2 =
FAC species		x 3 =
FACU species		x 4 =
UPL species		x 5 =
Column Totals:	(A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation
✔ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a located in the forested floodplain of Little Pine Creek.

SOIL

Sampling Point: DP9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 4/2	90	7.5YR 4/6	10	C	PL	silty clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✔ No ______

Remarks:

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: Little Pine Creek III Restoration Project City/County: Alleghany Sampling Date: 1/21/13

Applicant/Owner: Wildands Engineering State: NC Sampling Point: DP10

Investigator(s): Matt Jenkins, PWS Section, Township, Range: Glade Creek Township

Landform (hillslope, terrace, etc.): breached pond Local relief (concave, convex, none): concave Slope (%): 1%

Subregion (LRR or MLRA): MLRA 228 Lat: N 36.507506 Long: W 81.002262 Datum: ______

Soil Map Unit Name: Watauga loam (WaE) NWI classification: R3UB3

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✔ No ______ (If no, explain in Remarks.)

Are Vegetation ______, Soil ______, or Hydrology ______ significantly disturbed? Are "Normal Circumstances" present? Yes ✔ No ______

Are Vegetation ______, Soil ______, or Hydrology ______ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✔ No ______	**Is the Sampled Area within a Wetland?** **Yes** ✔ **No** ______
Hydric Soil Present?	Yes ✔ No ______	
Wetland Hydrology Present?	Yes ✔ No ______	

Remarks:

Sampling point is representative of a jurisdictional wetland area located within the footprint of an old pond bed. The dam has been historically breached.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✔ Surface Water (A1)
- ✔ High Water Table (A2)
- ✔ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ✔ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ True Aquatic Plants (B14)
- ___ Hydrogen Sulfide Odor (C1)
- ✔ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✔ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ✔ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✔ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ✔ No ______	Depth (inches): 6-12"	
Water Table Present?	Yes ✔ No ______	Depth (inches): <12"	
Saturation Present? (includes capillary fringe)	Yes ✔ No ______	Depth (inches): <12"	**Wetland Hydrology Present? Yes** ✔ **No** ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: DP10

Tree Stratum (Plot size: 30')	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	40	Yes	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
	40 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15')			
1. Alnus serrulata	50	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	50 = Total Cover		
Herb Stratum (Plot size: 5')			
1. Cyperus strigosus	25	Yes	FACW
2. Juncus effusus	25	Yes	FACW
3. Microstegium vimineum	25	Yes	FAC
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	75 = Total Cover		
Woody Vine Stratum (Plot size: 30')			
1.			
2.			
3.			
4.			
5.			
6.			
	0 = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species		x 4 =	
UPL species		x 5 =	
Column Totals:	(A)		(B)

Prevalence Index = B/A = ______

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ✔ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** ✔ **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

Site is a located in the forested valley of UT4, within the footprint of a breached pond bed.

SOIL

Sampling Point: DP10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 4/2	90	7.5YR 4/4	10	C	PL	silt loam	
8-12+	10YR 4/2	100					silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ 2 cm Muck (A10) **(LRR N)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1) **(LRR N, MLRA 147, 148)**
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) **(MLRA 147, 148)**
- ___ Thin Dark Surface (S9) **(MLRA 147, 148)**
- ___ Loamy Gleyed Matrix (F2)
- ✔ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Iron-Manganese Masses (F12) **(LRR N, MLRA 136)**
- ___ Umbric Surface (F13) **(MLRA 136, 122)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 148)**

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) **(MLRA 147)**
- ___ Coast Prairie Redox (A16) **(MLRA 147, 148)**
- ___ Piedmont Floodplain Soils (F19) **(MLRA 136, 147)**
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** ✔ **No** ______

Remarks:

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland AA	**Date**	05/10/12
Wetland Type	Headwater Forest	**Assessor Name/Organization**	Matt Jenkins, PWS
Level III Ecoregion	Blue Ridge Mountains	**Nearest Named Water Body**	Little Pine Creek
River Basin	New	**USGS 8-Digit Catalogue Unit**	05050001
( ) **Yes** (x) **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	36.515979°N, 80.995867°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? (x) Yes ( ) No

Describe effects of stressors that are present.
Wetland located within a narrow riparian area of an actively managed agricultural pasture. Soils are somewhat compacted from cattle grazing.

Regulatory Considerations
Select all that apply to the assessment area.

- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)

( ) Blackwater
(x) Brownwater
[ ] Tidal (if tidal, check one of the following boxes) ( ) Lunar ( ) Wind ( ) Both

Is the assessment area on a coastal island? ( ) Yes (x) No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ( ) Yes (x) No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
(x) A	(x) A	Not severely altered
( ) B	( ) B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
(x) A	(x) A	Water storage capacity and duration are not altered.
( ) B	( ) B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
( ) C	( ) C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
( ) A	( ) A	Majority of wetland with depressions able to pond water > 1 foot deep
( ) B	( ) B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
(x) C	(x) C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
( ) D	( ) D	Depressions able to pond water < 3 inches deep

( ) A Evidence that maximum depth of inundation is greater than 2 feet
( ) B Evidence that maximum depth of inundation is between 1 and 2 feet
(x) C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

☐ A Sandy soil
☒ B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
☐ C Loamy or clayey soils not exhibiting redoxymorphic features
☐ D Loamy or clayey gleyed soil
☐ E Histosol or histic epipedon

☒ A Soil ribbon < 1 inch
☐ B Soil ribbon ≥ 1 inch

☒ A No peat or muck presence
☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☒ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☒ C	☒ C	☒ C	Confined animal operations (or other local, concentrated source of pollutants)
☒ D	☒ D	☒ D	≥ 20% coverage of pasture
☒ E	☒ E	☒ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☒ B From 30 to < 50 feet
☐ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☒ C	☒ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☒ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☒ I	☒ I	☒ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☒ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☒ E	☐ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☒ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☐ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

☐

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
☒ B	☒ B	Canopy present, but opened more than natural gaps
☐ C	☐ C	Canopy sparse or absent
☐ A	☐ A	Dense mid-story/sapling layer
☐ B	☐ B	Moderate density mid-story/sapling layer
☒ C	☒ C	Mid-story/sapling layer sparse or absent
☐ A	☐ A	Dense shrub layer
☒ B	☒ B	Moderate density shrub layer
☐ C	☐ C	Shrub layer sparse or absent
☐ A	☐ A	Dense herb layer
☒ B	☒ B	Moderate density herb layer
☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland AA	Date	05/10/12
Wetland Type	Headwater Forest	Assessor Name/Organization	Matt Jenkins, PWS

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**HIGH**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **HIGH**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name Little Pine III Restoration - Wetland BB
Date 05/10/12
Wetland Type Headwater Forest
Assessor Name/Organization Matt Jenkins, PWS
Level III Ecoregion Blue Ridge Mountains
Nearest Named Water Body Little Pine Creek
River Basin New
USGS 8-Digit Catalogue Unit 05050001
[ ] **Yes** [x] **No** **Precipitation within 48 hrs?**
Latitude/Longitude (deci-degrees) 36.515979°N, 80.995867°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.
- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Describe effects of stressors that are present.
Wetland located within a narrow riparian area of an actively managed agricultural pasture. Soils are somewhat compacted from cattle grazing.

Regulatory Considerations
Select all that apply to the assessment area.
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[x] A	[x] A	Not severely altered
[ ] B	[ ] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[x] A	[x] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
[x] D	[x] D	Depressions able to pond water < 3 inches deep

[ ] A	Evidence that maximum depth of inundation is greater than 2 feet
[ ] B	Evidence that maximum depth of inundation is between 1 and 2 feet
[x] C	Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoxymorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[ ] A	[x] A	Little or no evidence of pollutants or discharges entering the assessment area
[x] B	[ ] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[x] C	[x] C	[x] C	Confined animal operations (or other local, concentrated source of pollutants)
[x] D	[x] D	[x] D	≥ 20% coverage of pasture
[x] E	[x] E	[x] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- [ ] A ≥ 50 feet
- [x] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[x] ≤ 15-feet wide [ ] > 15-feet wide [ ] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[x] Yes [ ] No

7e. Is tributary or other open water sheltered or exposed?
- [x] Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[ ] C	[ ] C	From 50 to < 80 feet
[x] D	[x] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[ ] G	[ ] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. **Inundation Duration – assessment area condition metric**
Answer for assessment area dominant landform.
- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☒ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**
Consider recent deposition only (no plant growth since deposition).
- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**
Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☒ I	☒ I	☒ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**
- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☒ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☒ E	☐ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric**
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.
- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**
- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**
- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

[ ]

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

[ ] A ≥ 25% coverage of vegetation
[ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
[ ] A	[ ] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
[ ] B	[ ] B	Canopy present, but opened more than natural gaps
[x] C	[x] C	Canopy sparse or absent
[ ] A	[ ] A	Dense mid-story/sapling layer
[ ] B	[ ] B	Moderate density mid-story/sapling layer
[x] C	[x] C	Mid-story/sapling layer sparse or absent
[ ] A	[ ] A	Dense shrub layer
[x] B	[x] B	Moderate density shrub layer
[ ] C	[ ] C	Shrub layer sparse or absent
[ ] A	[ ] A	Dense herb layer
[x] B	[x] B	Moderate density herb layer
[ ] C	[ ] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

[ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
[x] B Not A

19. Diameter Class Distribution – wetland type condition metric

[ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
[x] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
[ ] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

[ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
[x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

[x] A Overbank and overland flow are not severely altered in the assessment area.
[ ] B Overbank flow is severely altered in the assessment area.
[ ] C Overland flow is severely altered in the assessment area.
[ ] D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland BB	Date	05/10/12
Wetland Type	Headwater Forest	Assessor Name/Organization	Matt Jenkins, PWS

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **HIGH**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name Little Pine III Restoration - Wetland CC
Date 05/10/12
Wetland Type Headwater Forest
Assessor Name/Organization Matt Jenkins, PWS
Level III Ecoregion Blue Ridge Mountains
Nearest Named Water Body Little Pine Creek
River Basin New
USGS 8-Digit Catalogue Unit 05050001
☐ **Yes** ☒ **No** **Precipitation within 48 hrs?**
Latitude/Longitude (deci-degrees) 36.510428°N, 80.998879°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.
- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Describe effects of stressors that are present.
Wetland located within a narrow riparian area of an actively managed agricultural pasture. Soils are somewhat compacted from cattle grazing.

Regulatory Considerations
Select all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☒ A	Not severely altered
☐ B	☐ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
☒ C	☒ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
☐ D	☐ D	Depressions able to pond water < 3 inches deep

☐ A Evidence that maximum depth of inundation is greater than 2 feet
☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
☒ C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.
- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoxymorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☒ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☑ C	☑ C	☑ C	Confined animal operations (or other local, concentrated source of pollutants)
☑ D	☑ D	☑ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☐ A ≥ 50 feet
- ☒ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☒ C	☒ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- [x] A Evidence of short-duration inundation (< 7 consecutive days)
- [ ] B Evidence of saturation, without evidence of inundation
- [ ] C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- [ ] A Sediment deposition is not excessive, but at approximately natural levels.
- [x] B Sediment deposition is excessive, but not overwhelming the wetland.
- [ ] C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
[ ] A	[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[ ] C	[ ] C	From 50 to < 100 acres
[ ] D	[ ] D	[ ] D	From 25 to < 50 acres
[ ] E	[ ] E	[ ] E	From 10 to < 25 acres
[ ] F	[ ] F	[ ] F	From 5 to < 10 acres
[ ] G	[ ] G	[ ] G	From 1 to < 5 acres
[ ] H	[ ] H	[ ] H	From 0.5 to < 1 acre
[x] I	[x] I	[x] I	From 0.1 to < 0.5 acre
[ ] J	[ ] J	[ ] J	From 0.01 to < 0.1 acre
[ ] K	[ ] K	[ ] K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- [ ] A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- [ ] B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
[ ] A	[ ] A	≥ 500 acres
[ ] B	[ ] B	From 100 to < 500 acres
[ ] C	[x] C	From 50 to < 100 acres
[x] D	[ ] D	From 10 to < 50 acres
[ ] E	[ ] E	< 10 acres
[ ] F	[ ] F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

[ ] Yes [ ] No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

- [ ] A No artificial edge within 150 feet in all directions
- [ ] B No artificial edge within 150 feet in four (4) to seven (7) directions
- [x] C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- [ ] A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- [x] B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- [ ] C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- [ ] A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- [ ] B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- [ ] C Vegetation is dominated by exotic species (>50% cover of exotics).

☐

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
☒ B	☒ B	Canopy present, but opened more than natural gaps
☐ C	☐ C	Canopy sparse or absent
☐ A	☐ A	Dense mid-story/sapling layer
☐ B	☐ B	Moderate density mid-story/sapling layer
☒ C	☒ C	Mid-story/sapling layer sparse or absent
☐ A	☐ A	Dense shrub layer
☒ B	☒ B	Moderate density shrub layer
☐ C	☐ C	Shrub layer sparse or absent
☐ A	☐ A	Dense herb layer
☒ B	☒ B	Moderate density herb layer
☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

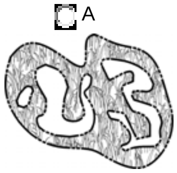
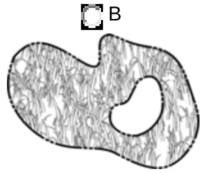
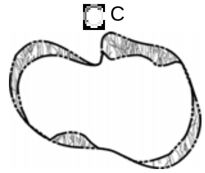
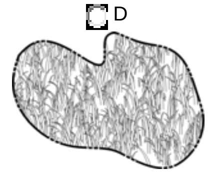
20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A

☐ B

☐ C

☐ D


22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland CC	Date	05/10/12
Wetland Type	Headwater Forest	Assessor Name/Organization	Matt Jenkins, PWS

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**HIGH**
	Sub-Surface Storage and Retention	Condition	**HIGH**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**HIGH**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **HIGH**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetlands DD & EE	**Date**	05/10/12
Wetland Type	Bottomland Hardwood Forest	**Assessor Name/Organization**	Matt Jenkins, PWS
Level III Ecoregion	Blue Ridge Mountains	**Nearest Named Water Body**	Little Pine Creek
River Basin	New	**USGS 8-Digit Catalogue Unit**	05050001
☐ **Yes** ☒ **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	36.507506°N, 81.002262°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☒ Yes ☐ No

Describe effects of stressors that are present.
Wetland located within an actively managed agricultural pasture. Soils are somewhat compacted from cattle grazing.

Regulatory Considerations
Select all that apply to the assessment area.
☐ Anadromous fish
☐ Federally protected species or State endangered or threatened species
☐ NCDWQ riparian buffer rule in effect
☐ Abuts a Primary Nursery Area (PNA)
☐ Publicly owned property
☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
☐ Designated NCNHP reference community
☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)
☐ Blackwater
☒ Brownwater
☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☐ A	Not severely altered
☐ B	☒ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
☒ D	☒ D	Depressions able to pond water < 3 inches deep

☐ A Evidence that maximum depth of inundation is greater than 2 feet
☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
☒ C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

- ☐ A Sandy soil
- ☒ B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
- ☐ C Loamy or clayey soils not exhibiting redoxymorphic features
- ☐ D Loamy or clayey gleyed soil
- ☐ E Histosol or histic epipedon

- ☒ A Soil ribbon < 1 inch
- ☐ B Soil ribbon ≥ 1 inch

- ☒ A No peat or muck presence
- ☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☒ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☑ C	☑ C	☑ C	Confined animal operations (or other local, concentrated source of pollutants)
☑ D	☑ D	☑ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**
7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.
7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
- ☒ A ≥ 50 feet
- ☐ B From 30 to < 50 feet
- ☐ C From 15 to < 30 feet
- ☐ D From 5 to < 15 feet
- ☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☒ ≤ 15-feet wide ☐ > 15-feet wide ☐ Other open water (no tributary present)
7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No
7e. Is tributary or other open water sheltered or exposed?
- ☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
- ☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☒ C	☒ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☒ B Evidence of saturation, without evidence of inundation
- ☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select “K” for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☒ H	☒ H	☒ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☒ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

☐

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
☐ B	☐ B	Canopy present, but opened more than natural gaps
☒ C	☒ C	Canopy sparse or absent
☐ A	☐ A	Dense mid-story/sapling layer
☐ B	☐ B	Moderate density mid-story/sapling layer
☒ C	☒ C	Mid-story/sapling layer sparse or absent
☐ A	☐ A	Dense shrub layer
☐ B	☐ B	Moderate density shrub layer
☒ C	☒ C	Shrub layer sparse or absent
☒ A	☒ A	Dense herb layer
☐ B	☐ B	Moderate density herb layer
☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☐ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☒ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetlands DD & EE	Date	05/10/12
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	Matt Jenkins, PWS

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**YES**
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland FF	**Date**	05/10/12
Wetland Type	Bottomland Hardwood Forest	**Assessor Name/Organization**	Matt Jenkins, PWS
Level III Ecoregion	Blue Ridge Mountains	**Nearest Named Water Body**	Little Pine Creek
River Basin	New	**USGS 8-Digit Catalogue Unit**	05050001
[ ] **Yes** [x] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	36.507506°N, 81.002262°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Describe effects of stressors that are present.
Wetland located within an actively managed agricultural pasture.

Regulatory Considerations
Select all that apply to the assessment area.

- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [x] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)

- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

1. Ground Surface Condition/Vegetation Condition – assessment area condition metric
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[ ] A	[ ] A	Not severely altered
[x] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[x] B	[x] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. Water Storage/Surface Relief – assessment area/wetland type condition metric
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
[x] C	[x] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
[ ] D	[ ] D	Depressions able to pond water < 3 inches deep

- [ ] A Evidence that maximum depth of inundation is greater than 2 feet
- [ ] B Evidence that maximum depth of inundation is between 1 and 2 feet
- [x] C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

- [ ] A Sandy soil
- [x] B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
- [ ] C Loamy or clayey soils not exhibiting redoxymorphic features
- [ ] D Loamy or clayey gleyed soil
- [ ] E Histosol or histic epipedon

- [x] A Soil ribbon < 1 inch
- [ ] B Soil ribbon ≥ 1 inch

- [x] A No peat or muck presence
- [ ] B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
[ ] A	[ ] A	Little or no evidence of pollutants or discharges entering the assessment area
[x] B	[x] B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
[ ] C	[ ] C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
[ ] A	[ ] A	[ ] A	≥ 10% impervious surfaces
[x] B	[x] B	[x] B	< 10% impervious surfaces
[x] C	[x] C	[x] C	Confined animal operations (or other local, concentrated source of pollutants)
[x] D	[x] D	[x] D	≥ 20% coverage of pasture
[ ] E	[ ] E	[ ] E	≥ 20% coverage of agricultural land (regularly plowed land)
[x] F	[x] F	[x] F	≥ 20% coverage of maintained grass/herb
[ ] G	[ ] G	[ ] G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
[ ] H	[ ] H	[ ] H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
[x] Yes [ ] No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.

- [x] A ≥ 50 feet
- [ ] B From 30 to < 50 feet
- [ ] C From 15 to < 30 feet
- [ ] D From 5 to < 15 feet
- [ ] E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
[ ] ≤ 15-feet wide [x] > 15-feet wide [ ] Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
[ ] Yes [x] No

7e. Is tributary or other open water sheltered or exposed?

- [x] Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
- [ ] Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
[ ] A	[ ] A	≥ 100 feet
[ ] B	[ ] B	From 80 to < 100 feet
[x] C	[x] C	From 50 to < 80 feet
[ ] D	[ ] D	From 40 to < 50 feet
[ ] E	[ ] E	From 30 to < 40 feet
[ ] F	[ ] F	From 15 to < 30 feet
[ ] G	[ ] G	From 5 to < 15 feet
[ ] H	[ ] H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☒ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☒ H	☒ H	☒ H	From 0.5 to < 1 acre
☐ I	☐ I	☐ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

[ ]

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

[ ] A ≥ 25% coverage of vegetation
[ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
[ ] A	[ ] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
[ ] B	[ ] B	Canopy present, but opened more than natural gaps
[x] C	[x] C	Canopy sparse or absent
[ ] A	[ ] A	Dense mid-story/sapling layer
[ ] B	[ ] B	Moderate density mid-story/sapling layer
[x] C	[x] C	Mid-story/sapling layer sparse or absent
[ ] A	[ ] A	Dense shrub layer
[ ] B	[ ] B	Moderate density shrub layer
[x] C	[x] C	Shrub layer sparse or absent
[x] A	[x] A	Dense herb layer
[ ] B	[ ] B	Moderate density herb layer
[ ] C	[ ] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

[ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
[x] B Not A

19. Diameter Class Distribution – wetland type condition metric

[ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
[ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
[x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

[ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
[x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

[ ] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
[ ] B Overbank flow is severely altered in the assessment area.
[x] C Overland flow is severely altered in the assessment area.
[ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland FF	Date	05/10/12
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	Matt Jenkins, PWS

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland GG	**Date**	05/10/12
Wetland Type	Bottomland Hardwood Forest	**Assessor Name/Organization**	Matt Jenkins, PWS
Level III Ecoregion	Blue Ridge Mountains	**Nearest Named Water Body**	Little Pine Creek
River Basin	New	**USGS 8-Digit Catalogue Unit**	05050001
[ ] **Yes** [x] **No**	**Precipitation within 48 hrs?**	**Latitude/Longitude (deci-degrees)**	36.507506°N, 81.002262°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [x] Yes [ ] No

Describe effects of stressors that are present.
Wetland located within an actively managed agricultural pasture.

Regulatory Considerations
Select all that apply to the assessment area.

- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [x] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)

- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[x] A	[x] A	Not severely altered
[ ] B	[ ] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[x] A	Water storage capacity and duration are not altered.
[x] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[ ] C	[ ] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
[ ] B	[ ] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
[x] C	[x] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
[ ] D	[ ] D	Depressions able to pond water < 3 inches deep

- [ ] A Evidence that maximum depth of inundation is greater than 2 feet
- [ ] B Evidence that maximum depth of inundation is between 1 and 2 feet
- [x] C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

☐ A Sandy soil
☒ B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
☐ C Loamy or clayey soils not exhibiting redoxymorphic features
☐ D Loamy or clayey gleyed soil
☐ E Histosol or histic epipedon

☒ A Soil ribbon < 1 inch
☐ B Soil ribbon ≥ 1 inch

☒ A No peat or muck presence
☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☒ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles and within the watershed draining to the assessment area (5M), and within 2 miles and within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☑ B	☑ B	☑ B	< 10% impervious surfaces
☑ C	☑ C	☑ C	Confined animal operations (or other local, concentrated source of pollutants)
☑ D	☑ D	☑ D	≥ 20% coverage of pasture
☐ E	☐ E	☐ E	≥ 20% coverage of agricultural land (regularly plowed land)
☑ F	☑ F	☑ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☒ B From 30 to < 50 feet
☐ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet or buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☐ ≤ 15-feet wide ☒ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☐ Yes ☒ No

7e. Is tributary or other open water sheltered or exposed?
☒ Sheltered – adjacent open water with width < 2500 feet and no regular boat traffic.
☐ Exposed – adjacent open water with width ≥ 2500 feet or regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☐ C	☐ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☒ E	☒ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☒ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☒ I	☒ I	☒ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☒ F	☒ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

- ☐ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☒ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☐ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☒ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

[ ]

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

[x] Yes [ ] No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

[ ] A ≥ 25% coverage of vegetation
[ ] B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
[ ] A	[ ] A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
[ ] B	[ ] B	Canopy present, but opened more than natural gaps
[x] C	[x] C	Canopy sparse or absent
[ ] A	[ ] A	Dense mid-story/sapling layer
[ ] B	[ ] B	Moderate density mid-story/sapling layer
[x] C	[x] C	Mid-story/sapling layer sparse or absent
[ ] A	[ ] A	Dense shrub layer
[ ] B	[ ] B	Moderate density shrub layer
[x] C	[x] C	Shrub layer sparse or absent
[x] A	[x] A	Dense herb layer
[ ] B	[ ] B	Moderate density herb layer
[ ] C	[ ] C	Herb layer sparse or absent

18. Snags – wetland type condition metric

[ ] A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
[x] B Not A

19. Diameter Class Distribution – wetland type condition metric

[ ] A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
[ ] B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
[x] C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

[ ] A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
[x] B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

[ ] A [ ] B [ ] C [ ] D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

[ ] A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
[ ] B Overbank flow is severely altered in the assessment area.
[x] C Overland flow is severely altered in the assessment area.
[ ] D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland GG	Date	05/10/12
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	Matt Jenkins, PWS

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	YES
Wetland is intensively managed (Y/N)	YES
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Particulate Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Soluble Change	Condition	**LOW**
		Condition/Opportunity	**LOW**
		Opportunity Presence? (Y/N)	**NO**
	Physical Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**NO**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**LOW**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**LOW**
	Condition/Opportunity	**LOW**
	Opportunity Presence? (Y/N)	
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland HH	**Date**	1/21/13
Wetland Type	Bottomland Hardwood Forest	**Assessor Name/Organization**	Ian Eckardt
Level III Ecoregion	Blue Ridge Mountains	**Nearest Named Water Body**	Little Pine Creek
River Basin	New	**USGS 8-Digit Catalogue Unit**	05050001
☒ **Yes** ☐ **No** **Precipitation within 48 hrs?**		**Latitude/Longitude (deci-degrees)**	36.507506°N, 81.002262°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? ☐ Yes ☒ No

Describe effects of stressors that are present.
Wetland located within a narrow riparian area of an actively managed agricultural pasture. Soils are somewhat compacted from cattle grazing.

Regulatory Considerations
Select all that apply to the assessment area.
- ☐ Anadromous fish
- ☐ Federally protected species or State endangered or threatened species
- ☐ NCDWQ riparian buffer rule in effect
- ☐ Abuts a Primary Nursery Area (PNA)
- ☐ Publicly owned property
- ☐ N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- ☐ Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- ☐ Designated NCNHP reference community
- ☐ Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)
- ☐ Blackwater
- ☒ Brownwater
- ☐ Tidal (if tidal, check one of the following boxes) ☐ Lunar ☐ Wind ☐ Both

Is the assessment area on a coastal island? ☐ Yes ☒ No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? ☐ Yes ☒ No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
☒ A	☒ A	Not severely altered
☐ B	☐ B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
☒ A	☒ A	Water storage capacity and duration are not altered.
☐ B	☐ B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
☐ C	☐ C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
☐ A	☐ A	Majority of wetland with depressions able to pond water > 1 foot deep
☐ B	☐ B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
☐ C	☐ C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
☒ D	☒ D	Depressions able to pond water < 3 inches deep

- ☐ A Evidence that maximum depth of inundation is greater than 2 feet
- ☐ B Evidence that maximum depth of inundation is between 1 and 2 feet
- ☒ C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

☐ A Sandy soil
☒ B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
☐ C Loamy or clayey soils not exhibiting redoxymorphic features
☐ D Loamy or clayey gleyed soil
☐ E Histosol or histic epipedon

☒ A Soil ribbon < 1 inch
☐ B Soil ribbon ≥ 1 inch

☒ A No peat or muck presence
☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☐ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☒ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☒ C	☒ C	☒ C	Confined animal operations (or other local, concentrated source of pollutants)
☒ D	☒ D	☒ D	≥ 20% coverage of pasture
☒ E	☒ E	☒ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☒ B From 30 to < 50 feet
☐ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☐ ≤ 15-feet wide ☒ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
☒ Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐ Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☐ B	☐ B	From 80 to < 100 feet
☒ C	☒ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. Inundation Duration – assessment area condition metric

Answer for assessment area dominant landform.

☒ A Evidence of short-duration inundation (< 7 consecutive days)
☐ B Evidence of saturation, without evidence of inundation
☐ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. Indicators of Deposition – assessment area condition metric

Consider recent deposition only (no plant growth since deposition).

☒ A Sediment deposition is not excessive, but at approximately natural levels.
☐ B Sediment deposition is excessive, but not overwhelming the wetland.
☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. Wetland Size – wetland type/wetland complex condition metric

Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☒ I	☒ I	☒ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre <u>or</u> assessment area is clear-cut

12. Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)

☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. Connectivity to Other Natural Areas – landscape condition metric

13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☐ B	☐ B	From 100 to < 500 acres
☐ C	☒ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☒ E	☐ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.

☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. Edge Effect – wetland type condition metric

May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.

☐ A No artificial edge within 150 feet in all directions
☒ B No artificial edge within 150 feet in four (4) to seven (7) directions
☐ C An artificial edge occurs within 150 feet in more than four (4) directions <u>or</u> assessment area is clear-cut

15. Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)

☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
☒ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
☐ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)

☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

☐

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
☒ B	☒ B	Canopy present, but opened more than natural gaps
☐ C	☐ C	Canopy sparse or absent
☐ A	☐ A	Dense mid-story/sapling layer
☒ B	☒ B	Moderate density mid-story/sapling layer
☐ C	☐ C	Mid-story/sapling layer sparse or absent
☐ A	☐ A	Dense shrub layer
☐ B	☐ B	Moderate density shrub layer
☒ C	☒ C	Shrub layer sparse or absent
☐ A	☐ A	Dense herb layer
☒ B	☒ B	Moderate density herb layer
☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank and overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank and overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland HH	Date	1/21/13
Wetland Type	Bottomland Hardwood Forest	Assessor Name/Organization	Ian Eckardt

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	NO
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**MEDIUM**
	Sub-Surface Storage and Retention	Condition	**MEDIUM**
Water Quality	Pathogen Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Particulate Change	Condition	**MEDIUM**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**YES**
	Soluble Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**MEDIUM**
	Landscape Patch Structure	Condition	**LOW**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**MEDIUM**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **MEDIUM**

NC WAM WETLAND ASSESSMENT FORM
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name Little Pine III Restoration - Wetland JJ
Date 1/21/13
Wetland Type Headwater Forest
Assessor Name/Organization Ian Eckardt
Level III Ecoregion Blue Ridge Mountains
Nearest Named Water Body Little Pine Creek
River Basin New
USGS 8-Digit Catalogue Unit 05050001
[x] **Yes** [ ] **No** **Precipitation within 48 hrs?**
Latitude/Longitude (deci-degrees) 36.507506°N, 81.002262°W

Evidence of stressors affecting the assessment area (may not be within the assessment area)
Please circle and/or make note below if evidence of stressors is apparent. Consider departure from reference, if appropriate, in recent past (for instance, approximately within 10 years). Noteworthy stressors include, but are not limited to the following.

- Hydrological modifications (examples: ditches, dams, beaver dams, dikes, berms, ponds, etc.)
- Surface and sub-surface discharges into the wetland (examples: discharges containing obvious pollutants, presence of nearby septic tanks, underground storage tanks (USTs), hog lagoons, etc.)
- Signs of vegetation stress (examples: vegetation mortality, insect damage, disease, storm damage, salt intrusion, etc.)
- Habitat/plant community alteration (examples: mowing, clear-cutting, exotics, etc.)

Is the assessment area intensively managed? [ ] Yes [x] No

Describe effects of stressors that are present.
Wetland located within a narrow riparian area of an actively managed agricultural pasture. Soils are somewhat compacted from cattle grazing.

Regulatory Considerations
Select all that apply to the assessment area.
- [ ] Anadromous fish
- [ ] Federally protected species or State endangered or threatened species
- [ ] NCDWQ riparian buffer rule in effect
- [ ] Abuts a Primary Nursery Area (PNA)
- [ ] Publicly owned property
- [ ] N.C. Division of Coastal Management Area of Environmental Concern (AEC) (including buffer)
- [ ] Abuts a stream with a NCDWQ classification of SA or supplemental classifications of HQW, ORW, or Trout
- [ ] Designated NCNHP reference community
- [ ] Abuts a 303(d)-listed stream or a tributary to a 303(d)-listed stream

What type of natural stream is associated with the wetland, if any? (Check all that apply)
- [ ] Blackwater
- [x] Brownwater
- [ ] Tidal (if tidal, check one of the following boxes) [ ] Lunar [ ] Wind [ ] Both

Is the assessment area on a coastal island? [ ] Yes [x] No

Is the assessment area's surface water storage capacity or duration substantially altered by beaver? [ ] Yes [x] No

1. **Ground Surface Condition/Vegetation Condition – assessment area condition metric**
Check a box in each column. Consider alteration to the ground surface (GS) in the assessment area and vegetation structure (VS) in the assessment area. Compare to reference wetland if applicable (see User Manual). If a reference is not applicable, then rate the assessment area based on evidence of an effect.

GS	VS	
[x] A	[ ] A	Not severely altered
[ ] B	[x] B	Severely altered over a majority of the assessment area (ground surface alteration examples: vehicle tracks, excessive sedimentation, fire-plow lanes, skidder tracks, bedding, fill, soil compaction, obvious pollutants) (vegetation structure alteration examples: mechanical disturbance, herbicides, salt intrusion [where appropriate], exotic species, grazing, less diversity [if appropriate], artificial hydrologic alteration)

2. **Surface and Sub-Surface Storage Capacity and Duration – assessment area condition metric**
Check a box in each column. Consider surface storage capacity and duration (Surf) and sub-surface storage capacity and duration (Sub). Consider both increase and decrease in hydrology. Refer to the current NRCS lateral effect of ditching guidance for North Carolina hydric soils (see USACE Wilmington District website) for the zone of influence of ditches in hydric soils. A ditch ≤ 1 foot deep is considered to affect surface water only, while a ditch > 1 foot deep is expected to affect both surface and ditch sub-surface water. Consider tidal flooding regime, if applicable.

Surf	Sub	
[ ] A	[ ] A	Water storage capacity and duration are not altered.
[ ] B	[ ] B	Water storage capacity or duration are altered, but not substantially (typically, not sufficient to change vegetation).
[x] C	[x] C	Water storage capacity or duration are substantially altered (typically, alteration sufficient to result in vegetation change) (examples: draining, flooding, soil compaction, filling, excessive sedimentation, underground utility lines).

3. **Water Storage/Surface Relief – assessment area/wetland type condition metric**
Check a box in each column for each group below. Select the appropriate storage for the assessment area (AA) and the wetland type (WT).

AA	WT	
[ ] A	[ ] A	Majority of wetland with depressions able to pond water > 1 foot deep
[x] B	[x] B	Majority of wetland with depressions able to pond water 6 inches to 1 foot deep
[ ] C	[ ] C	Majority of wetland with depressions able to pond water 3 to 6 inches deep
[ ] D	[ ] D	Depressions able to pond water < 3 inches deep

- [ ] A Evidence that maximum depth of inundation is greater than 2 feet
- [x] B Evidence that maximum depth of inundation is between 1 and 2 feet
- [ ] C Evidence that maximum depth of inundation is less than 1 foot

4. **Soil Texture/Structure – assessment area condition metric**
Check a box from each of the three soil property groups below. Dig soil profile in the dominant assessment area landscape feature. Make soil observations within the 12 inches. Use most recent National Technical Committee for Hydric Soils guidance for regional indicators.

☐ A Sandy soil
☒ B Loamy or clayey soils exhibiting redoxymorphic features (concentrations, depletions, or rhizospheres)
☐ C Loamy or clayey soils not exhibiting redoxymorphic features
☐ D Loamy or clayey gleyed soil
☐ E Histosol or histic epipedon

☒ A Soil ribbon < 1 inch
☐ B Soil ribbon ≥ 1 inch

☒ A No peat or muck presence
☐ B A peat or muck presence

5. **Discharge into Wetland – opportunity metric**
Check a box in each column. Consider surface pollutants or discharges (Surf) and sub-surface pollutants or discharges (Sub). Examples of sub-surface discharges include presence of nearby septic tank, underground storage tank (UST), etc.

Surf	Sub	
☒ A	☒ A	Little or no evidence of pollutants or discharges entering the assessment area
☐ B	☐ B	Noticeable evidence of pollutants or discharges entering the wetland and stressing, but not overwhelming the treatment capacity of the assessment area
☐ C	☐ C	Noticeable evidence of pollutants or discharges (pathogen, particulate, or soluble) entering the assessment area and potentially overwhelming the treatment capacity of the wetland (water discoloration, dead vegetation, excessive sedimentation, odor)

6. **Land Use – opportunity metric**
Check all that apply (at least one box in each column). Evaluation involves a GIS effort with field adjustment. Consider sources draining to assessment area within entire upstream watershed (WS), within 5 miles <u>and</u> within the watershed draining to the assessment area (5M), and within 2 miles <u>and</u> within the watershed draining to the assessment area (2M). Effective riparian buffers are considered to be 50 feet wide in the Coastal Plain and Piedmont ecoregions and 30 feet wide in the Blue Ridge Mountains ecoregion.

WS	5M	2M	
☐ A	☐ A	☐ A	≥ 10% impervious surfaces
☒ B	☒ B	☒ B	< 10% impervious surfaces
☐ C	☐ C	☐ C	Confined animal operations (or other local, concentrated source of pollutants)
☒ D	☒ D	☒ D	≥ 20% coverage of pasture
☒ E	☒ E	☒ E	≥ 20% coverage of agricultural land (regularly plowed land)
☒ F	☒ F	☒ F	≥ 20% coverage of maintained grass/herb
☐ G	☐ G	☐ G	≥ 20% coverage of silvicultural land characterized by a clear-cut < 5 years old
☐ H	☐ H	☐ H	Little or no opportunity to improve water quality. Lack of opportunity may result from hydrologic alterations that prevent drainage or overbank flow from affecting the assessment area.

7. **Wetland Acting as Vegetated Buffer – assessment area condition metric**

7a. Is assessment area within 50 feet of a tributary or other open water?
☒ Yes ☐ No If Yes, continue to 7b. If No, skip to Metric 8.
Wetland buffer need only be present on one side of the water body. Make buffer judgment based on the average width of the wetland. Record a note if a portion of the buffer has been removed or disturbed.

7b. How much of the first 50 feet from the bank is weltand? Descriptor E should be selected if ditches effectively bypass the buffer.
☐ A ≥ 50 feet
☒ B From 30 to < 50 feet
☐ C From 15 to < 30 feet
☐ D From 5 to < 15 feet
☐ E < 5 feet <u>or</u> buffer bypassed by ditches

7c. Tributary width. If the tributary is anastomosed, combine widths of channels/braids for a total width.
☐ ≤ 15-feet wide ☒ > 15-feet wide ☐ Other open water (no tributary present)

7d. Do roots of assessment area vegetation extend into the bank of the tributary/open water?
☒ Yes ☐ No

7e. Is tributary or other open water sheltered or exposed?
☒ Sheltered – adjacent open water with width < 2500 feet <u>and</u> no regular boat traffic.
☐ Exposed – adjacent open water with width ≥ 2500 feet <u>or</u> regular boat traffic.

8. **Wetland Width at the Assessment Area – wetland type/wetland complex metric**
Check a box in each column for riverine wetlands only. Select the appropriate width for the wetland type at the assessment area (WT) and the wetland complex at the assessment areas (WC). See User Manual for WT and WC boundaries.

WT	WC	
☐ A	☐ A	≥ 100 feet
☒ B	☐ B	From 80 to < 100 feet
☐ C	☒ C	From 50 to < 80 feet
☐ D	☐ D	From 40 to < 50 feet
☐ E	☐ E	From 30 to < 40 feet
☐ F	☐ F	From 15 to < 30 feet
☐ G	☐ G	From 5 to < 15 feet
☐ H	☐ H	< 5 feet

9. **Inundation Duration – assessment area condition metric**
Answer for assessment area dominant landform.
- ☐ A Evidence of short-duration inundation (< 7 consecutive days)
- ☐ B Evidence of saturation, without evidence of inundation
- ☒ C Evidence of long-duration inundation or very long-duration inundation (7 to 30 consecutive days or more)

10. **Indicators of Deposition – assessment area condition metric**
Consider recent deposition only (no plant growth since deposition).
- ☒ A Sediment deposition is not excessive, but at approximately natural levels.
- ☐ B Sediment deposition is excessive, but not overwhelming the wetland.
- ☐ C Sediment deposition is excessive and is overwhelming the wetland.

11. **Wetland Size – wetland type/wetland complex condition metric**
Check a box in each column. Involves a GIS effort with field adjustment. This metric evaluates three aspects of the wetland area: the size of the wetland type (WT), the size of the wetland complex (WC), and the size of the forested wetland (FW) (if applicable, see User Manual). See the User Manual for boundaries of these evaluation areas. If assessment area is clear-cut, select "K" for the FW column.

WT	WC	FW (if applicable)	
☐ A	☐ A	☐ A	≥ 500 acres
☐ B	☐ B	☐ B	From 100 to < 500 acres
☐ C	☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	☐ D	From 25 to < 50 acres
☐ E	☐ E	☐ E	From 10 to < 25 acres
☐ F	☐ F	☐ F	From 5 to < 10 acres
☐ G	☐ G	☐ G	From 1 to < 5 acres
☐ H	☐ H	☐ H	From 0.5 to < 1 acre
☒ I	☒ I	☒ I	From 0.1 to < 0.5 acre
☐ J	☐ J	☐ J	From 0.01 to < 0.1 acre
☐ K	☐ K	☐ K	< 0.01 acre or assessment area is clear-cut

12. **Wetland Intactness – wetland type condition metric (evaluate for Pocosins only)**
- ☐ A Pocosin is the full extent (≥ 90%) of its natural landscape size.
- ☐ B Pocosin is < 90% of the full extent of its natural landscape size.

13. **Connectivity to Other Natural Areas – landscape condition metric**
13a. **Check appropriate box(es) (a box may be checked in each column). Involves a GIS effort with field adjustment.** This metric evaluates whether the wetland is well connected (Well) and/or loosely connected (Loosely) to the landscape patch, the contiguous naturally vegetated area and open water (if appropriate). Boundaries are formed by four-lane roads, urban landscapes, maintained fields (pasture open and agriculture), or water > 300 feet wide.

Well	Loosely	
☐ A	☐ A	≥ 500 acres
☒ B	☒ B	From 100 to < 500 acres
☐ C	☐ C	From 50 to < 100 acres
☐ D	☐ D	From 10 to < 50 acres
☐ E	☐ E	< 10 acres
☐ F	☐ F	Wetland type has a poor or no connection to other natural habitats

13b. **Evaluate for marshes only**.
☐ Yes ☐ No Wetland type has a surface hydrology connection to open waters/stream or tidal wetlands.

14. **Edge Effect – wetland type condition metric**
May involve a GIS effort with field adjustment. Estimate distance from wetland type boundary to artificial edges. Artificial edges include permanent features such as fields, development, two-lane or larger roads (≥ 40-feet wide), utility line corridors wider than a two-lane road, and clear-cuts < 10 years old. Consider the eight main points of the compass.
- ☒ A No artificial edge within 150 feet in all directions
- ☐ B No artificial edge within 150 feet in four (4) to seven (7) directions
- ☐ C An artificial edge occurs within 150 feet in more than four (4) directions or assessment area is clear-cut

15. **Vegetative Composition – assessment area condition metric (skip for all marshes and Pine Flat)**
- ☐ A Vegetation is close to reference condition in species present and their proportions. Lower strata composed of appropriate species, with exotic plants absent or sparse within the assessment area.
- ☒ B Vegetation is different from reference condition in species diversity or proportions, but still largely composed of native species characteristic of the wetland type. This may include communities of weedy native species that develop after clearcutting or clearing. It also includes communities with exotics present, but not dominant, over a large portion of the expected strata.
- ☐ C Vegetation severely altered from reference in composition. Expected strata are unnaturally absent or dominated by exotic species or composed of planted stands of non-characteristic species or inappropriately composed of a single species.

16. **Vegetative Diversity – assessment area condition metric (evaluate for Non-tidal Freshwater Marsh only)**
- ☐ A Vegetation diversity is high and is composed primarily of native species (<10% cover of exotics).
- ☐ B Vegetation diversity is low or has > 10% to 50% cover of exotics.
- ☐ C Vegetation is dominated by exotic species (>50% cover of exotics).

☐

17. Vegetative Structure – assessment area/wetland type condition metric

17a. Is vegetation present?

☒ Yes ☐ No If Yes, continue to 17b. If No, skip to Metric 18.

17b. Evaluate percent coverage of vegetation **for all marshes only**. Skip to 17c for non-marsh wetlands.

☐ A ≥ 25% coverage of vegetation
☐ B < 25% coverage of vegetation

17c. **Check a box in each column for each stratum**. Evaluate this portion of the metric **for non-marsh wetlands**. Consider structure in airspace above the assessment area (AA) and the wetland type (WT) separately.

AA	WT	
☐ A	☐ A	Canopy closed, or nearly closed, with natural gaps associated with natural processes
☒ B	☒ B	Canopy present, but opened more than natural gaps
☐ C	☐ C	Canopy sparse or absent
☐ A	☐ A	Dense mid-story/sapling layer
☐ B	☐ B	Moderate density mid-story/sapling layer
☒ C	☒ C	Mid-story/sapling layer sparse or absent
☐ A	☐ A	Dense shrub layer
☐ B	☐ B	Moderate density shrub layer
☒ C	☒ C	Shrub layer sparse or absent
☐ A	☐ A	Dense herb layer
☒ B	☒ B	Moderate density herb layer
☐ C	☐ C	Herb layer sparse or absent

18. Snags – wetland type condition metric

☐ A Large snags (more than one) are visible (> 12-inches DBH, or large relative to species present and landscape stability).
☒ B Not A

19. Diameter Class Distribution – wetland type condition metric

☐ A Majority of canopy trees have stems > 6 inches in diameter at breast height (DBH); many large trees (> 12 inches DBH) are present.
☒ B Majority of canopy trees have stems between 6 and 12 inches DBH, few are > 12-inch DBH.
☐ C Majority of canopy trees are < 6 inches DBH or no trees.

20. Large Woody Debris – wetland type condition metric

Include both natural debris and man-placed natural debris.

☐ A Large logs (more than one) are visible (> 12 inches in diameter, or large relative to species present and landscape stability).
☒ B Not A

21. Vegetation/Open Water Dispersion – wetland type/open water condition metric (evaluate for Non-Tidal Freshwater Marsh only)

Select the figure that best describes the amount of interspersion between vegetation and open water in the growing season. Patterned areas indicate vegetated areas, while solid white areas indicate open water.

☐ A ☐ B ☐ C ☐ D

22. Hydrologic Connectivity – assessment area condition metric

Evaluate for riverine wetlands only. Examples of activities that may severely alter hydrologic connectivity include intensive ditching, fill, sedimentation, channelization, diversion, man-made berms, beaver dams, and stream incision.

☒ A Overbank <u>and</u> overland flow are not severely altered in the assessment area.
☐ B Overbank flow is severely altered in the assessment area.
☐ C Overland flow is severely altered in the assessment area.
☐ D Both overbank <u>and</u> overland flow are severely altered in the assessment area.

Notes

NC WAM Wetland Rating Sheet
Accompanies User Manual Version 3.0
Rating Calculator Version 3.0

Wetland Site Name	Little Pine III Restoration - Wetland JJ	Date	1/21/13
Wetland Type	Headwater Forest	Assessor Name/Organization	Ian Eckardt

Presence of stressor affecting assessment area (Y/N)	YES
Notes on Field Assessment Form (Y/N)	NO
Presence of regulatory considerations (Y/N)	NO
Wetland is intensively managed (Y/N)	NO
Assessment area is located within 50 feet of a natural tributary or other open water (Y/N)	YES
Assessment area is substantially altered by beaver (Y/N)	NO

Sub-function Rating Summary

Function	Sub-function	Metrics	Rating
Hydrology	Surface Storage and Retention	Condition	**LOW**
	Sub-Surface Storage and Retention	Condition	**LOW**
Water Quality	Pathogen Change	Condition	**LOW**
		Condition/Opportunity	**MEDIUM**
		Opportunity Presence? (Y/N)	**YES**
	Particulate Change	Condition	**HIGH**
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
	Soluble Change	Condition	**MEDIUM**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Physical Change	Condition	**HIGH**
		Condition/Opportunity	**HIGH**
		Opportunity Presence? (Y/N)	**YES**
	Pollution Change	Condition	NA
		Condition/Opportunity	NA
		Opportunity Presence? (Y/N)	NA
Habitat	Physical Structure	Condition	**LOW**
	Landscape Patch Structure	Condition	**HIGH**
	Vegetation Composition	Condition	**MEDIUM**

Function Rating Summary

Function	Metrics/Notes	Rating
Hydrology	Condition	**LOW**
Water Quality	Condition	**HIGH**
	Condition/Opportunity	**HIGH**
	Opportunity Presence? (Y/N)	**YES**
Habitat	Conditon	**LOW**

Overall Wetland Rating **LOW**

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): July, 2012

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - Little Pine Creek and Wetlands FF and GG

State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.506104° **N**, Long. 81.0060083° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: May 18, 2012
☒ Field Determination. Date(s): May 10, 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]

   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: ~3,230 linear feet: 15width (ft) and/or 1.1 acres.
   Wetlands: ~0.8 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]

   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):

☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size:approx. 0.8acres
Wetland type. Explain:Bottomland Hardwood Forest - Riverine Wetlands.
Wetland quality. Explain:Impacted by active cattle grazing and vegetation maintenance.
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Perennial flow**. Explain: receives groundwater flow.

Surface flow is**: Discrete**
Characteristics: .

Subsurface flow: **Yes**. Explain findings: groundwater from natural springs.
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☒ Directly abutting
☐ Not directly abutting
- ☐ Discrete wetland hydrologic connection. Explain: .
- ☐ Ecological connection. Explain: .
- ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **1-2** river miles from TNW.
Project waters are **1-2** aerial (straight) miles from TNW.
Flow is from: **Wetland to navigable waters.**
Estimate approximate location of wetland as within the **50 - 100-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: areas have no canopy trees with dense herbaceous layer. Impacted from cattle grazing and show evidence of cattle waste runoff.
Identify specific pollutants, if known: cattle waste.

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☒ Vegetation type/percent cover. Explain:100% FACW and OBL.
☐ Habitat for:
- ☐ Federally Listed species. Explain findings: .
- ☐ Fish/spawn areas. Explain findings: .
- ☐ Other environmentally-sensitive species. Explain findings: .
- ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **2**
Approximately (~0.8) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland FF	0.6	Y	
Wetland GG	0.2	Y	

Summarize overall biological, chemical and physical functions being performed: wetlands provide flood storage and treat some overland runoff pollutants.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: Little Pine Creek is a very large perennial channel, which drains approximately 2,784 acres of mountain pastures, forested areas, and farmland. This channel exhibited strong perennial flow, well-defined riffle-pool sequences, average channel widths of 12-15 feet, persistent groundwater flow, a moderate presence of fish and crayfish, and a strong presence of aquatic invertebrates. Little Pine Creek scored 61 out of 100 possible points on the USACE Stream Quality Assessment Form and scored 45.5 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating perennial status.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **~3,230** linear feet**12-15** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetlands FF and GG are directly connected to Little Pine Creek via surface water connections.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **~0.8**acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Spart East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): March, 2013

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - UT1
State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.515979° **N**, Long. 81.001850° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: March, 2013
☒ Field Determination. Date(s): January 21, 2013

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: 356 linear feet: 2-3width (ft) and/or 0.02 acres.
   Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 2,700 **acres**
Drainage area: 29 **acres**
Average annual rainfall: 50 inches
Average annual snowfall: 22 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **3** tributaries before entering TNW.

Project waters are **1-2** river miles from TNW.
Project waters are **1-2** river miles from RPW.
Project waters are **1-2** aerial (straight) miles from TNW.
Project waters are **1-2** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: N/A.

Identify flow route to TNW[5]: UT1 flows to Little Pine Creek to Brush Creek.
Tributary stream order, if known: First.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: Trib has been ditched in the past for agricultural purposes.

Tributary properties with respect to top of bank (estimate):
Average width: 2-3 feet
Average depth: 3 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☒ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: eroding banks, lack of vegetation.
Presence of run/riffle/pool complexes. Explain: weak.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 1-2 %

(c) Flow:

Tributary provides for: **Intermittent but not seasonal flow**
Estimate average number of flow events in review area/year: **11-20**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: ditched channel.

Subsurface flow: **Yes**. Explain findings: hydric indicators in soil.
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☐ the presence of litter and debris
☒ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☒ vegetation matted down, bent, or absent	☒ sediment sorting
☐ leaf litter disturbed or washed away	☒ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: watershed is within an active agricultural area with active pastures. channel has been ditched in the past with unstable banks and lack of riparian vegetation.
Identify specific pollutants, if known: cattle waste.

---

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: UT1 to Little Pine Creek is a small intermittent channel, which drains approximately 29 acres of mountain pastures and a small amount of forested areas. This reach exhibited moderate base flow, ordinary high water marks, average channel widths of 2-3 feet, strongly ditched bed and banks, and substrate consisting of silt to small gravel. UT1 scored 30 out of 100

possible points on the USACE Stream Quality Assessment Form and scored 22.25 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating intermittent status.

Provide estimates for jurisdictional waters in the review area (check all that apply):

☒ Tributary waters: **356** linear feet**2-3** width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**

☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):

☐ Tributary waters: linear feet width (ft).

☐ Other non-wetland waters: acres.

Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**

☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.

☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**

☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**

☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**

As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.

☐ Demonstrate that impoundment was created from "waters of the U.S.," or

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or

☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.

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[8] See Footnote # 3.

[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Sparta East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): July, 2012

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - UT2 and Wetlands AA, BB, DD, and EE

State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.506104° **N**, Long. 81.0060083° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: May 18, 2012
☒ Field Determination. Date(s): May 10, 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**

   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]

   ☐ TNWs, including territorial seas
   ☐ Wetlands adjacent to TNWs
   ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
   ☐ Non-RPWs that flow directly or indirectly into TNWs
   ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
   ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
   ☐ Impoundments of jurisdictional waters
   ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
   Non-wetland waters: ~4,450 linear feet: 4width (ft) and/or 0.4 acres.
   Wetlands: ~1 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
   Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]

   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:approx. 1.0acres

Wetland type. Explain:Headwater Forest and Bottomland Hardwood Forest - Riverine Wetlands.

Wetland quality. Explain:Impacted by active cattle grazing and vegetation maintenance.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Perennial flow**. Explain: receives groundwater flow.

Surface flow is**: Discrete**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: groundwater from natural springs.

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☒ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **1-2** river miles from TNW.

Project waters are **1-2** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2-year or less** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: areas have sparse to no canopy trees with dense herbaceous layer. Impacted from cattle grazing and show evidence of cattle waste runoff.

Identify specific pollutants, if known: cattle waste.

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☒ Riparian buffer. Characteristics (type, average width):sparse forest, 50-80 feet.
- ☒ Vegetation type/percent cover. Explain:100% FACW and OBL.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **4**

Approximately (1.0) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland AA	0.4	Y	
Wetland BB	0.1	Y	
Wetland DD	0.1	Y	
Wetland EE	0.4	Y	

Summarize overall biological, chemical and physical functions being performed: wetlands provide some flood storage and treat some overland runoff pollutants.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT2 to Little Pine Creek is a perennial channel, which drains approximately 197 acres of mountain pastures, forested areas, and farmland. This reach exhibited strong perennial flow, ordinary high water marks, average channel widths of 4-6 feet, persistent groundwater flow, a weak presence of fish and crayfish, and a strong presence of aquatic invertebrates. UT2 Creek scored 50 and 56 out of 100 possible points on the USACE Stream Quality Assessment Form and scored 36 and 41.5 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating perennial status.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **~4,450** linear feet **4-6** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetlands AA, BB, DD, and EE are directly connected to UT2 via surface water connections.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **~1.0**acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Spart East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): July, 2012

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - UT2A
State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.506104° N, Long. 81.0060083° W.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: May 18, 2012
☒ Field Determination. Date(s): May 10, 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: ~2,263 linear feet: 4-6width (ft) and/or 0.26 acres.
      Wetlands: ~1 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT2A to Little Pine Creek is a perennial channel, which drains approximately 89 acres of mountain pastures and forested areas. This reach exhibited strong perennial flow, ordinary high water marks, average channel widths of 4-6 feet, persistent groundwater flow, a weak presence of crayfish and a moderate presence of aquatic invertebrates. UT2A Creek scored 84 out of 100 possible points on the USACE Stream Quality Assessment Form and scored 42 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating perennial status.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **~2,263** linear feet **4-6** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Spart East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): July, 2012

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - UT2B and Wetland CC

State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.506104° **N**, Long. 81.0060083° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: May 18, 2012
☒ Field Determination. Date(s): May 10, 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply): [1]**
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: ~953 linear feet: 3width (ft) and/or 0.07 acres.
      Wetlands: ~0.25 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):[3]**
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

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[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:approx. 0.25acres

Wetland type. Explain:Headwater Forest - Riverine Wetland.

Wetland quality. Explain:Impacted by active cattle grazing and vegetation maintenance.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Perennial flow**. Explain: receives spring flow.

Surface flow is**: Discrete**

Characteristics: .

Subsurface flow: **Yes**. Explain findings: groundwater from natural springs.

☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☒ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **1-2** river miles from TNW.

Project waters are **1-2** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **2-year or less** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: area has sparse canopy coverage with dense herbaceous layer. Impacted from cattle grazing and shows evidence of cattle waste runoff.

Identify specific pollutants, if known: cattle waste.

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☒ Riparian buffer. Characteristics (type, average width):sparse forest, 50-80 feet.
- ☒ Vegetation type/percent cover. Explain:100% FACW and OBL.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **1**

Approximately (~0.25) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland CC	0.25	Y	

Summarize overall biological, chemical and physical functions being performed: wetlands provide treat some overland runoff pollutants.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT2B to Little Pine Creek is largely a perennial channel, which drains approximately 19 acres of mountain pastures and forested areas. This channel exhibited perennial flow, ordinary high water marks, average channel widths of 3-4 feet, strong headcuts, moderate sinuosity, a weak presence of crayfish, and a strong presence of aquatic invertebrates. UT2B scored 50 out of 100 possible points on the USACE Stream Quality Assessment Form and scored 37.5 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating perennial status.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **~953** linear feet **3** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetland CC is directly connected to UT2B via surface water connection.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **~0.25**acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Spart East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): July, 2012

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - UT3
State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.515979° **N**, Long. 81.001850° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: July 19, 2012
☒ Field Determination. Date(s): July 18, 2012

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply): [1]

☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☐ Non-RPWs that flow directly or indirectly into TNWs
☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:
Non-wetland waters: ~371 linear feet: 4-6width (ft) and/or 0.04 acres.
Wetlands: acres.

c. Limits (boundaries) of jurisdiction based on: **1987 Delineation Manual**
Elevation of established OHWM (if known): .

2. Non-regulated waters/wetlands (check if applicable):[3]

☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

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[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank ☐ the presence of litter and debris
☐ changes in the character of soil ☐ destruction of terrestrial vegetation
☐ shelving ☐ the presence of wrack line
☐ vegetation matted down, bent, or absent ☐ sediment sorting
☐ leaf litter disturbed or washed away ☐ scour
☐ sediment deposition ☐ multiple observed or predicted flow events
☐ water staining ☐ abrupt change in plant community
☐ other (list):
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by: ☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects ☐ survey to available datum;
☐ fine shell or debris deposits (foreshore) ☐ physical markings;
☐ physical markings/characteristics ☐ vegetation lines/changes in vegetation types.
☐ tidal gauges
☐ other (list):

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size: acres
Wetland type. Explain: .
Wetland quality. Explain: .
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**
Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☐ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **Pick List** river miles from TNW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Flow is from: **Pick List.**
Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .
Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .
☐ Vegetation type/percent cover. Explain: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**
Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT3 to Little Pine Creek is a perennial channel, which drains approximately 24 acres of mountain pastures and forested areas and receives hydrology from an off-site pond. This reach exhibited strong base flow, ordinary high water marks, average channel widths of 4-6 feet, persistent groundwater flow, a moderate presence of crayfish and aquatic invertebrates. UT3 scored 80 out of 100 possible points on the USACE Stream Quality Assessment Form and scored 38.5 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating perennial status.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **~371** linear feet **4-6** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: **.**
☐ Other: (explain, if not covered above): **.**

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Sparta East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): March, 2013

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Little Pine Creek III Restoration Project - UT4 and Wetlands HH and JJ

State:NC County/parish/borough: Alleghany City: Ennice
Center coordinates of site (lat/long in degree decimal format): Lat. 36.506104° **N**, Long. 81.0060083° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Little Pine Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Brush Creek
Name of watershed or Hydrologic Unit Code (HUC): New 05050001

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: March, 2013
☒ Field Determination. Date(s): January 21, 2013

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce. Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 1,493 linear feet: 4width (ft) and/or 0.14 acres.
      Wetlands: 0.61 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional. Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY)**:**

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. **Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.**

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):
☐ Silts ☐ Sands ☐ Concrete
☐ Cobbles ☐ Gravel ☐ Muck
☐ Bedrock ☐ Vegetation. Type/% cover:
☐ Other. Explain: .

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):
☐ clear, natural line impressed on the bank
☐ changes in the character of soil
☐ shelving
☐ vegetation matted down, bent, or absent
☐ leaf litter disturbed or washed away
☐ sediment deposition
☐ water staining
☐ other (list):
☐ the presence of litter and debris
☐ destruction of terrestrial vegetation
☐ the presence of wrack line
☐ sediment sorting
☐ scour
☐ multiple observed or predicted flow events
☐ abrupt change in plant community
☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):
☐ High Tide Line indicated by:
☐ oil or scum line along shore objects
☐ fine shell or debris deposits (foreshore)
☐ physical markings/characteristics
☐ tidal gauges
☐ other (list):
☐ Mean High Water Mark indicated by:
☐ survey to available datum;
☐ physical markings;
☐ vegetation lines/changes in vegetation types.

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

☐ Riparian corridor. Characteristics (type, average width): .
☐ Wetland fringe. Characteristics: .
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:
Properties:
Wetland size:0.61acres
Wetland type. Explain:Upper and Lower Perennial Riverine Wetlands.
Wetland quality. Explain:Forested; good quality.
Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:
Flow is: **Perennial flow**. Explain: receives hydrologic input from perennial UT4.

Surface flow is**: Discrete and confined**
Characteristics: .

Subsurface flow: **Yes**. Explain findings: groundwater from natural springs.
☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:
☒ Directly abutting
☐ Not directly abutting
  ☐ Discrete wetland hydrologic connection. Explain: .
  ☐ Ecological connection. Explain: .
  ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW
Project wetlands are **1-2** river miles from TNW.
Project waters are **1-2** aerial (straight) miles from TNW.
Flow is from: **Wetland to navigable waters.**
Estimate approximate location of wetland as within the **2-year or less** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: Wetlands exhibit clear water from forested watershed area, no recent impacts or vegetation disturbances.
Identify specific pollutants, if known: N/A.

(iii) Biological Characteristics. Wetland supports (check all that apply):

☒ Riparian buffer. Characteristics (type, average width):Forested, 100-300 feet.
☒ Vegetation type/percent cover. Explain:100% Forested FAC and FACW.
☐ Habitat for:
  ☐ Federally Listed species. Explain findings: .
  ☐ Fish/spawn areas. Explain findings: .
  ☐ Other environmentally-sensitive species. Explain findings: .
  ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **2**
Approximately (0.61) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland HH	0.42	Y	
Wetland JJ	0.19	Y	

Summarize overall biological, chemical and physical functions being performed: wetlands treat some overland runoff pollutants.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   ☐ TNWs: linear feet width (ft), Or, acres.
   ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT4 to Little Pine Creek is a perennial channel, which drains approximately 25 acres of mountain forested areas. This channel exhibited perennial flow, ordinary high water marks, average channel widths of 3-4 feet, weak sinuosity, and a moderate presence of aquatic invertebrates. UT4 scored 67 out of 100 possible points on the USACE Stream Quality Assessment Form and scored 31.5 out of 61.5 total points on the NCDWQ Stream Classification Form, indicating perennial status.

☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **1,493** linear feet**4** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☒ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **Wetlands JJ and HH are directly connected to UT4 via surface water connection.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: **0.61**acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.

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[8]See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name:Sparta East and Cumberland Knob, NC.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation:Alleghany County Soils.
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

APPENDIX 3. Project Site NCDWQ Stream Classification & USACE Stream Quality Assessment Worksheets

NC DWQ Stream Identification Form Version 4.11

Date: 5/10/12	Project/Site: Little Pine III	Latitude: 36.515979°N
Evaluator: MLJ	County: Alleghany	Longitude: 80.995867° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 36	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other SCP1 - Upper UT2 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 7)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 5/10/12	Project/Site: Little Pine III	Latitude: 36.511751° N
Evaluator: MLS	County: Alleghany	Longitude: 81.001853° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 42	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other SCP2 - UT2A *e.g. Quad Name:*

A. Geomorphology (Subtotal = 24)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 5/10/12	Project/Site: Little Pine III	Latitude: 36.510428°N
Evaluator: MLJ	County: Alleghany	Longitude: 80.998879°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 28	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other SCP3 - UT2B *e.g. Quad Name:*

A. Geomorphology (Subtotal = 15)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 6)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 5/10/12	Project/Site: Little Pine II	Latitude: 36.510158° N
Evaluator: MLJ	County: Alleghany	Longitude: 80.99935° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 37.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** SCP4 - UT2B *e.g. Quad Name:*

A. Geomorphology (Subtotal = 19.5)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9.5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 5/10/12	Project/Site: Little Pine III	Latitude: 36.507506° N
Evaluator: MLJ	County: Alleghany	Longitude: 81.002262° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 41.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other *e.g. Quad Name:* SCP5 - Lower UT2

A. Geomorphology (Subtotal = 23)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 10)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 5/10/12	Project/Site: Little Pine III	Latitude: 36.506104°N
Evaluator: MLJ	County: Alleghany	Longitude: 81.006008°W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 45.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	Other *e.g. Quad Name:* SCP6 - Little Pine Creek

A. Geomorphology (Subtotal = 24)	Absent	Weak	Moderate	Strong
1ª Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

ª artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10)	Absent	Weak	Moderate	Strong
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 7/18/12	Project/Site: Little Pine III	Latitude: 36.515979° N
Evaluator: MLJ	County: Alleghany	Longitude: 81.001850° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 38.5	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	**Other** *e.g. Quad Name:* SCP7 - UT3

A. Geomorphology (Subtotal = 21)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 8.5)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 9)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	~~1~~	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/21/13	Project/Site: Little Pine III	Latitude: 36.502656°N
Evaluator: MLJ / IJE	County: Alleghany	Longitude: 80.998722° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 31.5	Stream Determination (circle one) Ephemeral Intermittent Perennial	Other SCP8 - UT4 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 14)	Absent	Weak	Moderate	Strong
1[a] Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

[a] artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 9)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 8.5)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes:

Sketch:

NC DWQ Stream Identification Form Version 4.11

Date: 1/21/13	Project/Site: Little Pine III	Latitude: 36.508395° N
Evaluator: MLS / ISE	County: Alleghany	Longitude: 80.003142° W
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30** 22.25	**Stream Determination (circle one)** Ephemeral Intermittent Perennial	Other SCP9 - UT1 *e.g. Quad Name:*

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1ª Continuity of channel bed and bank	0	1	2	3
2. Sinuosity of channel along thalweg	0	1	2	3
3. In-channel structure: ex. riffle-pool, step-pool, ripple-pool sequence	0	1	2	3
4. Particle size of stream substrate	0	1	2	3
5. Active/relict floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Recent alluvial deposits	0	1	2	3
8. Headcuts	0	1	2	3
9. Grade control	0	0.5	1	1.5
10. Natural valley	0	0.5	1	1.5
11. Second or greater order channel	No = 0		Yes = 3	

ª artificial ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7)				
12. Presence of Baseflow	0	1	2	3
13. Iron oxidizing bacteria	0	1	2	3
14. Leaf litter	1.5	1	0.5	0
15. Sediment on plants or debris	0	0.5	1	1.5
16. Organic debris lines or piles	0	0.5	1	1.5
17. Soil-based evidence of high water table?	No = 0		Yes = 3	

C. Biology (Subtotal = 3.75)				
18. Fibrous roots in streambed	3	2	1	0
19. Rooted upland plants in streambed	3	2	1	0
20. Macrobenthos (note diversity and abundance)	0	1	2	3
21. Aquatic Mollusks	0	1	2	3
22. Fish	0	0.5	1	1.5
23. Crayfish	0	0.5	1	1.5
24. Amphibians	0	0.5	1	1.5
25. Algae	0	0.5	1	1.5
26. Wetland plants in streambed	FACW = 0.75; OBL = 1.5 Other = 0			

*perennial streams may also be identified using other methods. See p. 35 of manual.

Notes: Caddis flies common with few Mayflies; weak diversity.

Sketch:

OFFICE USE ONLY:	USACE AID#______________________	DWQ #__________________________

SCP1 – Upper UT2 (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 5/10/12
4. Time of Evaluation: 10:00am
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 75 acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.515979°N, 80.995867°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: light rain within the past 24 hours
15. Site conditions at time of visit: overcast, 50°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:___________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 70 % Agricultural 30 % Forested ____% Cleared / Logged ____% Other (__________________)
21. Bankfull Width: 6-8'
22. Bank Height (from bed to top of bank): 3-4'
23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight ____Occasional Bends X Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 56 **Comments:**______________________________________

Evaluator's Signature______________________________ **Date** 5/10/2012

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET
SCP1 – Upper UT2 (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	1
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	1
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	3
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	2
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				56

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#______________________	DWQ #__________________________

SCP2 – UT2A (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 5/10/12
4. Time of Evaluation: 10:30am
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 89 acres
8. Stream Order: Second
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.511751°N, 81.001853°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: light rain within the past 24 hours
15. Site conditions at time of visit: overcast, 55°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: 0.42 ac
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 70 % Agricultural 30 % Forested ____% Cleared / Logged ____% Other (__________________)
21. Bankfull Width: 10-12'
22. Bank Height (from bed to top of bank): 2-3'
23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight ____Occasional Bends X Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 84 **Comments:**______________________________

Evaluator's Signature______________________ **Date** 5/10/2012

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET
SCP2 – UT2A (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	5
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	5
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	5
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	5
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	4
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	5
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	6
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	5
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	4
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	3
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	3
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						84

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#________________________	DWQ #____________________________

SCP3 – UT2B (Intermittent RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 5/10/12
4. Time of Evaluation: 11:00am
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 19 acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.510428°N, 80.998879°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: light rain within the past 24 hours
15. Site conditions at time of visit: sunny, 60°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:____________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 60 % Agricultural
 40 % Forested ____% Cleared / Logged ____% Other (__________________)
21. Bankfull Width: 3-6'
22. Bank Height (from bed to top of bank): 1-3'
23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight X Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 41 **Comments:**____

Evaluator's Signature________________________ **Date** 5/10/2012

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP3 – UT2B (Intermittent RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	2
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	2
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				41

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#______________________	DWQ #__________________________

SCP4 – UT2B (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 5/10/12
4. Time of Evaluation: 11:15am
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 19 acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.510158°N, 80.99935°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: light rain within the past 24 hours
15. Site conditions at time of visit: sunny, 60°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:___________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 60 % Agricultural 40 % Forested ____% Cleared / Logged ____% Other (_________________)
21. Bankfull Width: 6-8'
22. Bank Height (from bed to top of bank): 2-5'
23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight ____Occasional Bends X Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 50 **Comments:**____

Evaluator's Signature___________________________ **Date** 5/10/2012

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP4 – UT2B (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	2
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	3
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				50

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#________________________	DWQ #____________________________

SCP5 – Lower UT2 (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 5/10/12
4. Time of Evaluation: 12:30pm
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 197 acres
8. Stream Order: Third
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.507506°N, 81.002262°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: light rain within the past 24 hours
15. Site conditions at time of visit: sunny, 65°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:___________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 70 % Agricultural 30 % Forested ____% Cleared / Logged ____% Other (_________________)
21. Bankfull Width: 6-8'
22. Bank Height (from bed to top of bank): 2-4'
23. Channel slope down center of stream: ____Flat (0 to 2%) X Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight ____Occasional Bends ____Frequent Meander X Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 50 **Comments:**______________________________

Evaluator's Signature______________________ **Date** 5/10/2012

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP5 – Lower UT2 (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	2
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	0
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	5
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	3
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	4
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						50

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#________________________ DWQ #____________________________

SCP6 – Little Pine Creek (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 5/10/12
4. Time of Evaluation: 1:30pm
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 2,784 acres
8. Stream Order: Fourth
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.506104°N, 81.006008°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: light rain within the past 24 hours
15. Site conditions at time of visit: sunny, 65°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat
 X Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:___________
18. Does channel appear on USGS quad map? YES NO 19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 75 % Agricultural
 25 % Forested ____% Cleared / Logged ____% Other (__________________)
21. Bankfull Width: 25-30'
22. Bank Height (from bed to top of bank): 3-5'
23. Channel slope down center of stream: X Flat (0 to 2%) ____Gentle (2 to 4%) ____Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight X Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 61 **Comments:**

Evaluator's Signature **Date** 5/10/2012

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP6 – Little Pine Creek (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	2
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	1
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	2
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	5
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	4
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	4
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	1
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	4
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	5
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	3
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				61

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#____________________ DWQ #____________________

SCP7 – UT3 (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins
3. Date of Evaluation: 7/18/12
4. Time of Evaluation: 1:00pm
5. Name of Stream: Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 24 acres
8. Stream Order: First
9. Length of Reach Evaluated: 100 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.515979°N, 81.001850°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: no rain within the past 24 hours
15. Site conditions at time of visit: sunny, 85°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area: 0.25 ac
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 60 % Agricultural
 40 % Forested ____% Cleared / Logged ____% Other (________________)
21. Bankfull Width: 4-6'
22. Bank Height (from bed to top of bank): 1-2'
23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight ____Occasional Bends X Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 80 **Comments:**____________________

Evaluator's Signature [signature] **Date** 7/18/2012

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET
SCP7 – UT3 (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	5
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	5
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	5
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	2
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	5
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	4
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	4
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	5
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	6
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	5
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	5
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	4
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	2
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	3
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				80

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#________________________ DWQ #____________________________

SCP8 – UT4 (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins & Ian Eckardt
3. Date of Evaluation: 1/21/13
4. Time of Evaluation: 11:00am
5. Name of Stream: UT4 to Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 32 acres
8. Stream Order: First
9. Length of Reach Evaluated: 200 lf
10. County: Alleghany
11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.
12. Site Coordinates (if known): 36.502656°N, 80.998722°W
13. Proposed Channel Work (if any): stream restoration/enhancement
14. Recent Weather Conditions: no rain within the past 48 hours
15. Site conditions at time of visit: sunny, 40°
16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)
17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:___________
18. Does channel appear on USGS quad map? YES NO
19. Does channel appear on USDA Soil Survey? YES NO
20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 5 % Agricultural 95 % Forested ____% Cleared / Logged ____% Other (__________________)
21. Bankfull Width: 6-8'
22. Bank Height (from bed to top of bank): 6-8'
23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)
24. Channel Sinuosity: ___Straight X Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 67 **Comments:**______________________________________

Evaluator's Signature______________________ **Date** 1/21/2013

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP8 – UT4 (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	5
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	4
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	4
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	0
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	0
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	4
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	4
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	5
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	3
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	5
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	4
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	4
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	3
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	2
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				67

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY:	USACE AID#______________________	DWQ #__________________________

SCP9 – UT1 (Intermittent RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name: Wildlands Engineering
2. Evaluator's Name: Matt Jenkins & Ian Eckardt
3. Date of Evaluation: 1/21/13
4. Time of Evaluation: 1:30pm
5. Name of Stream: UT1 to Little Pine Creek
6. River Basin: New River 05050001
7. Approximate Drainage Area: 26 acres
8. Stream Order: First
9. Length of Reach Evaluated: 100 lf
10. County: Alleghany

11. Location of reach under evaluation (include nearby roads and landmarks): From Mt. Airy, NC, travel west on NC-89 for approximately 20 miles. Turn left onto NC-18 S and travel approximately 2.3 miles to Glade Valley Road. Turn left onto Glade Valley Road and travel approximately 2.7 miles to Barrett Road. Turn right onto Barrett Road, travel approximately 3.2 miles and turn left onto Big Oak Road; site will be approximately 0.8 miles on the left.

12. Site Coordinates (if known): 36.508395°N, 81.003142°W

13. Proposed Channel Work (if any): stream restoration/enhancement

14. Recent Weather Conditions: no rain within the past 48 hours

15. Site conditions at time of visit: sunny, 40°

16. Identify any special waterway classifications known: ____Section 10 ____Tidal Waters ____Essential Fisheries Habitat ____Trout Waters ____Outstanding Resource Waters ____ Nutrient Sensitive Waters ____Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? YES NO If yes, estimate the water surface area:___________

18. Does channel appear on USGS quad map? YES NO 19. Does channel appear on USDA Soil Survey? YES NO

20. Estimated Watershed Land Use: ____% Residential ____% Commercial ____% Industrial 80 % Agricultural
20 % Forested ____% Cleared / Logged ____% Other (_________________)

21. Bankfull Width: 6-8'
22. Bank Height (from bed to top of bank): 2-3'

23. Channel slope down center of stream: ____Flat (0 to 2%) ____Gentle (2 to 4%) X Moderate (4 to 10%) ____Steep (>10%)

24. Channel Sinuosity: ___Straight X Occasional Bends ____Frequent Meander ____Very Sinuous ____Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 30 **Comments:**______________________________

Evaluator's Signature______________________ **Date** 1/21/2013

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP9 – UT1 (Intermittent RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	3
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	2
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	1
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	1
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	4
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	1
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
		Total Points Possible	100	100	100	
		TOTAL SCORE (also enter on first page)				30

* These characteristics are not assessed in coastal streams.

APPENDIX 4. Resource Agency Correspondence

April 11, 2012

Renee Gledhill-Earley
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Subject: **NCEEP - Little Pine Creek III Restoration Project**
Alleghany County, North Carolina

Dear Ms. Gledhill-Earley,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential wetland and stream restoration project on the attached site (USGS site map and aerial photograph with approximate areas of potential ground disturbance are enclosed). Figure 1 was prepared from the Sparta East and Cumberland Knob, NC 7.5-Minute Topographic Quadrangles.

The Little Pine Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of channel have been identified as significantly degraded.

No architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. The site has historically been disturbed due to agricultural purposes, specifically for cattle. Photographs of the site are enclosed.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

1430 South Mint Street, Suite 104 Charlotte, NC 28203 ◦ (P) 704-332-7754 ◦ (F) 704-332-3306

North Carolina Department of Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Beverly Eaves Perdue, Governor
Linda A. Carlisle, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

May 3, 2012

Andrea Eckardt
Wildlands Engineering
1430 South Mint Street
Suite 104
Charlotte, NC 28203

Re: Little Pine Creek III Restoration Project, Alleghany County, ER 12-0581

Dear Ms. Eckardt:

Thank you for your letter of April 11, 2012, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

Sincerely,

Renee Gledhill-Earley

for Ramona M. Bartos

April 11, 2012

Tyler Howe
Tribal Historic Preservation Specialist
Eastern Band of Cherokee Indians
Tribal Historic Preservation Office
PO Box 455
Cherokee, NC 28719

Subject: **NCEEP - Little Pine Creek III Restoration Project**
Alleghany County, North Carolina

Dear Mr. Howe,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or religious resources associated with a potential wetland enhancement and stream restoration project on the attached site (USGS site map and aerial photograph with approximate areas of potential ground disturbance are enclosed). Figure 1 was prepared from the Sparta East and Cumberland Knob, NC 7.5-Minute Topographic Quadrangles.

A similar letter has been sent to the North Carolina State Preservation Office for compliance with Section 106 of the Historic Preservation Act.

The Little Pine Creek site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of channel have been identified as significantly degraded. No architectural structures or archeological artifacts have been observed or noted during preliminary surveys of the site for restoration purposes. The site has historically been disturbed due to agricultural purposes, specifically for cattle. Photographs of the site are enclosed.

We ask that you review this site based on the attached information to determine if you know of any existing resources that we need to know about. In addition, please let us know the level of your future involvement with this project needs to be (if any).

We thank you in advance for your timely response and cooperation. Please feel free to contact the below referenced EEP Project Manager with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

Cc:
Donnie Brew
EEP Project Manager
1652 Mail Service Center
Raleigh, NC 27699

April 11, 2012

Marella Buncick
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: NCEEP - Little Pine Creek III Restoration Project
Alleghany County, North Carolina

Dear Ms. Buncick,

The Little Pine Creek III Restoration Site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of stream channels throughout the site have been identified as significantly degraded as a result of past agricultural activities. Additionally, several on-site areas have been identified for wetland enhancement.

We have already obtained an updated species list for Alleghany County from your web site (http://nc-es.fws.gov/es/countyfr.html). The threatened or endangered species for this county are: the bog turtle *(Clemmys muhlenbergii).* We are requesting that you please provide any known information for the species in the county. The USFWS will be contacted if suitable habitat for any listed species is found or if we determine that the project may affect one or more federally listed species or designated critical habitat.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds or other trust resources from the construction of a stream and wetland enhancement project on the subject properties. A USGS map (Figure 1) and an aerial photograph (Figure 2) showing the approximate project area are enclosed. Figure 1 was prepared from the Sparta East and Cumberland Knob, NC 7.5-Minute Topographic Quadrangles.

If we have not heard from you in 30 days we will assume that our species list and site determination are correct, that you do not have any comments regarding associated laws and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt L. Jenkins, PWS
Environmental Scientist

Attachment:
Figure 1. USGS Topographic Map
Figure 2. Aerial Photograph

Andrea Eckardt

From: Andrea Eckardt
Sent: Monday, April 23, 2012 2:00 PM
To: 'Clary, Kent - NRCS, Waynesville, NC'
Subject: RE: AD1006 Form - Little Pine Creek III Restoration Project
Attachments: AD1006 LPC Completed Form.pdf

Kent-
Attached is the completed form for you files.

Thanks so much for your help.

Andrea

Andrea Spangler Eckardt
Wildlands Engineering, Inc.
704-332-7754 ext 101

From: Clary, Kent - NRCS, Waynesville, NC [mailto:Kent.Clary@nc.usda.gov]
Sent: Monday, April 23, 2012 11:30 AM
To: Andrea Eckardt
Subject: RE: AD1006 Form - Little Pine Creek III Restoration Project

Andrea,

See attached.
Kent

From: Andrea Eckardt [mailto:aeckardt@wildlandseng.com]
Sent: Tuesday, April 17, 2012 10:42 AM
To: Clary, Kent - NRCS, Waynesville, NC
Subject: AD1006 Form - Little Pine Creek III Restoration Project

Kent-
I have attached the AD1006 Form for the Little Pine Creek III Restoration Project which is located in Alleghany County. I have also attached a USGS Map and Soils Map of the proposed stream restoration project.

The Soils breakdown on within the project area is as follows-

- Codorus complex - 12.6 acres
- Chester loam, 10-25% slopes - 9.4 acres
- Alluvial land, wet (Nikwasi) - 1.2 acres
- Ashe stony fine sandy loam, 25-45% slopes - 0.7 acres
- Tate loam, 6-10% slops - 0.4 acres
- Watauga loam, 25-45% slopes - 0.2 acres
- Chester clay loam, 25-45% slopes, eroded - 0.2 acres
- Gullied lan - 0.1 acre
- Watauga loam, 10-25% slopes - 0.1 acre

Please let me know if you need any additional information to complete Parts II and IV of the form.

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request 4/17/12
Name Of Project Little Pine Creek III Restoration Project	Federal Agency Involved FHWA - NCEEP
Proposed Land Use Stream and Wetland Restoration	County And State Alleghany County, NC
PART II *(To be completed by NRCS)*	Date Request Received By NRCS 6/1/11

Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply -- do not complete additional parts of this form).*	Yes ☑ No ☐	Acres Irrigated -	Average Farm Size 148
Major Crop*(s)* Hay	Farmable Land In Govt. Jurisdiction Acres: 99,037 % 66		Amount Of Farmland As Defined in FPPA Acres: 5952 % 4
Name Of Land Evaluation System Used Alleghany Cales	Name Of Local Site Assessment System		Date Land Evaluation Returned By NRCS 4/23/12

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		24.8			
B. Total Acres To Be Converted Indirectly					
C. Total Acres In Site		24.8	0.0	0.0	0.0
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland		12.6			
B. Total Acres Statewide And Local Important Farmland		9.8			
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted		0.0			
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value		56.8			
PART V *(To be completed by NRCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*		49	0	0	0
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*	Maximum Points				
1. Area In Nonurban Use	15	15			
2. Perimeter In Nonurban Use	10	10			
3. Percent Of Site Being Farmed	20	15			
4. Protection Provided By State And Local Government	20	20			
5. Distance From Urban Builtup Area	15	15			
6. Distance To Urban Support Services	15	15			
7. Size Of Present Farm Unit Compared To Average	10	10			
8. Creation Of Nonfarmable Farmland	10	0			
9. Availability Of Farm Support Services	5	3			
10. On-Farm Investments	20	5			
11. Effects Of Conversion On Farm Support Services	10	0			
12. Compatibility With Existing Agricultural Use	10	0			
TOTAL SITE ASSESSMENT POINTS	160	108	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100	49	0	0	0
Total Site Assessment *(From Part VI above or a local site assessment)*	160	108	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	157	0	0	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection:

(See Instructions on reverse side) **Form AD-1006 (10-83)**

This form was electronically produced by National Production Services Staff

April 11, 2012

Shannon Deaton
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: **NCEEP - Little Pine Creek III Restoration Project**
Alleghany County, North Carolina

Dear Ms. Deaton,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with a potential stream and wetland restoration project on the attached site. A USGS map (Figure 1) and an aerial photograph (Figure 2) showing the approximate project area are enclosed. Figure 1 was prepared from the Sparta East and Cumberland Knob, NC 7.5-Minute Topographic Quadrangles.

The Little Pine Creek III Restoration Project has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel and wetland impacts. Several sections of channel throughout the site have been identified as significantly degraded as a result of past agricultural activities, including cattle. Additionally, several on-site areas have been identified for wetland enhancement.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Andrea S. Eckardt

Andrea S. Eckardt
Senior Environmental Planner

Attachment:
Figure 1. USGS Topographic Map
Figure 2. Aerial Photograph

1430 South Mint Street, Suite 104, Charlotte, NC 28203 ◦ (P) 704-332-7754 ◦ (F) 704-332-3306

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

May 1, 2012

Andrea Eckardt
Wildlands Engineering
1430 South Mint Street, Suite 104
Charlotte, NC 28203

SUBJECT: Little Pine Creek III Restoration Project, Alleghany County

Dear Ms. Eckardt:

Biologists with the North Carolina Wildlife Resources Commission (Commission) received your April 11, 2012 letter about the NCEEP stream mitigation project on Little Pine Creek in Alleghany County. Comments from the Commission on this proposal are offered for your consideration under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

Under an agreement between the U.S. Army Corps of Engineers (ACOE) and the Commission, our biologists review all Nationwide Permit applications in Alleghany County and make recommendations to minimize the adverse effects of some activities, including restoration work, on trout. Once a permit application is prepared for this project, a copy must be sent to me in order to solicit our recommendations for consideration by the ACOE.

Little Pine Creek reportedly supports a population of stream-bred brown trout. This project should benefit trout in time, though construction work will initially degrade habitat. Project construction should occur outside of the October 15 to April 15 period when brown trout will be spawning in the creek.

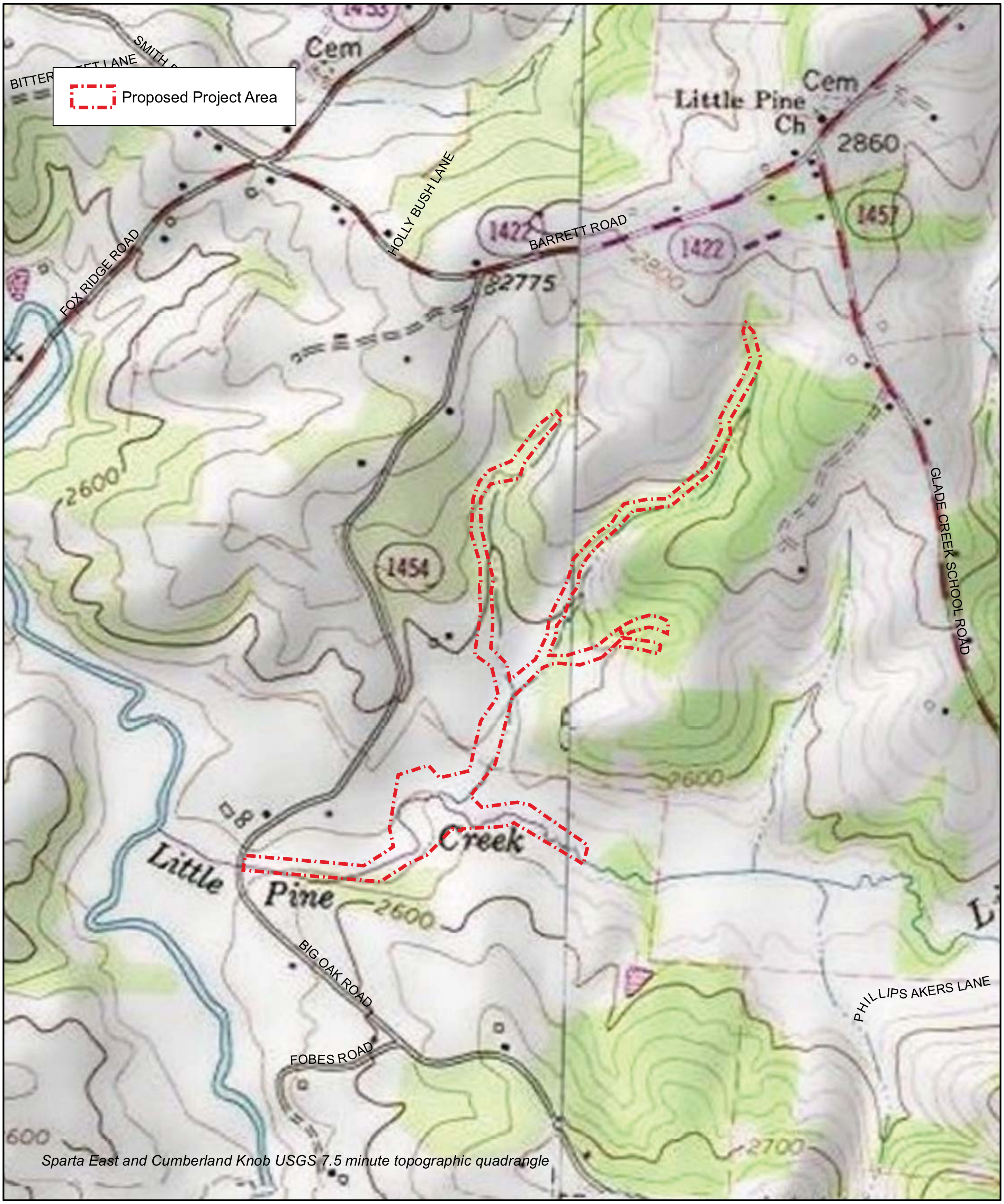
Mature riparian vegetation should be preserved as much as possible because it promotes the stability of channel work and provides seed sources for natural regeneration, organic material to the stream, and riparian habitat complexity until planted vegetation matures. The use of balled or container grown trees is recommended along the outside of channel bends to expedite long-term bank stability. Also, any stream channel modifications should create dimensions, patterns, and profiles that mimic stable, reference conditions. Overly sinuous stream channels should be avoided.

Thank you for the opportunity to review and comment on this project. Please contact me at (828) 452-2546 ext. 24 if you have any questions about these comments.

Sincerely,

Dave McHenry
Mountain Region Coordinator, Habitat Conservation Program

Little Pine Creek III Restoration Project



0 450 900 Feet

N

WILDLANDS ENGINEERING

Figure 1
Little Pine Creek III
Restoration Project
New River Basin 05050001

Alleghany County, NC

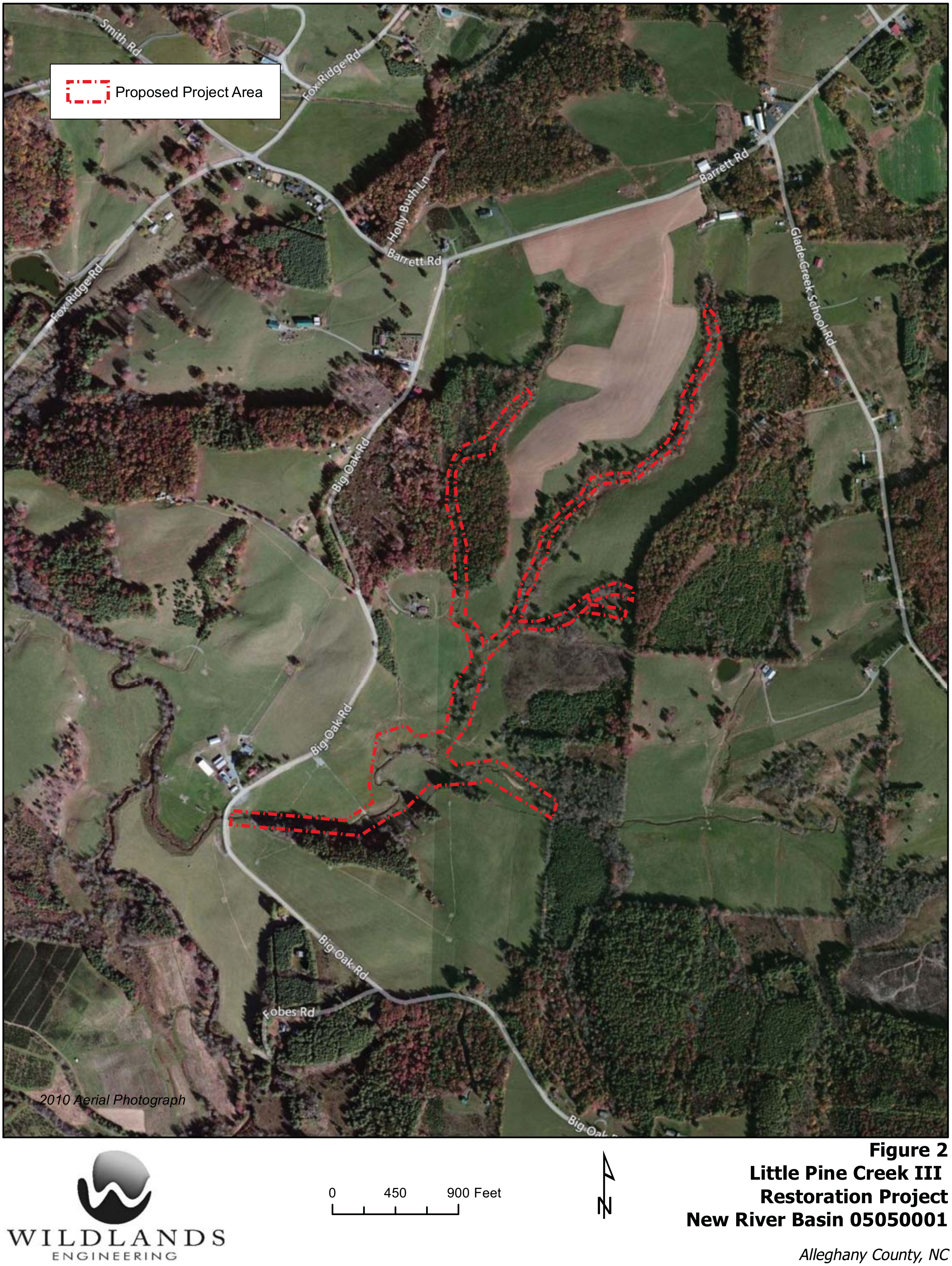


Figure 2
Little Pine Creek III
Restoration Project
New River Basin 05050001

Alleghany County, NC

WILDLANDS
ENGINEERING

Christine Blackwelder

Subject: FW: stream restoration project in floodplain

From: Garrett, Steve [mailto:sgarrett@ncem.org]
Sent: Friday, December 02, 2011 11:36 AM
To: Aaron Earley
Subject: RE: stream restoration project in floodplain

Aaron,

Little Pine Creek was not studied. So as long as you stay out of the non-encroachment area of Brush Creek (which you will be if you are upstream of Big Oak Road), then a flood study should not be required, unless the community has adopted a higher standard. You will still need a floodplain development permit from the county. Please contact Travis Dalton, Planner, at acplanning@skybest.com or 336-372-2942 for permitting requirements.

Please let me know if you have additional questions.

Thanks,
Steve

Steve Garrett, CFM
LOMC Manager/Community Development Planner II
Office of Geospatial and Technology Management
North Carolina Division of Emergency Management
1812 Tillery Place, Suite 105, Raleigh, NC 27604
4719 Mail Service Center, Raleigh, NC 27699-4719
Phone: 919-715-5711 ext. 118
Fax: 919-715-0408

http://www.ncfloodmaps.com

From: Aaron Earley [mailto:aearley@wildlandseng.com]
Sent: Friday, December 02, 2011 10:37 AM
To: Garrett, Steve
Subject: stream restoration project in floodplain

We are in the initial phases of a stream restoration project on Little Pine Creek in Alleghany County. Little Pine Creek is not a detailed study stream but is a tributary to Brush Creek, which is a detailed study stream. The attached figures show our project limits. All of our work will be on Little Pine Creek upstream of Big Oak Road, a portion of which is within the flooding effects from Brush Creek. We will be doing some floodplain benching and adjusting the profile of Little Pine Creek. We are trying to determine what will be required from a floodplain permitting perspective. Would a technical letter with figures suffice for a no-impact certification or would a full blown hydraulic study of Brush Creek be required? The BFEs of Brush Creek will obviously not change; the only change would be the delineation of the floodplain limits due to the proposed grading upstream of Big Oak Road.

Let me know your thoughts and thanks for your time.

Aaron Earley, PE
Senior Water Resources Engineer

Wildlands Engineering, Inc.
P: 704-332-7754 x.109
M: 704-819-0848
www.wildlandseng.com

MEETING NOTES

PROJECT NAME:	Little Pine Creek #3 Stream and Wetland Restoration Project
DATE:	August 15, 2012
LOCATION:	Project Site
TOPIC:	Field Meeting
SUBMITTED BY:	Matt Jenkins

ATTENDEES:

NAME	GROUP
Tyler Crumbley	US Army Corps of Engineers (USACE)
Sue Homewood	North Carolina Division of Water Quality (NCDWQ)
Marella Buncick	US Fish and Wildlife Service (USFWS)
Harry Tsomides	North Carolina Ecosystem Enhancement Program (NCEEP)
Shawn Wilkerson	Wildlands Engineering, Inc. (WEI)
Matt Jenkins	Wildlands Engineering, Inc. (WEI)

The following items were discussed during the site walk:

1. Discussed the overall background of the project according to Figure 6 of the Concept Plan (enclosed) including the closed easements with Jeff Anders as well as the option agreements with the Edwards and Huber properties.
2. Marella discussed whether or not there was any potential for restoring/enhancing wetland habitat for bog turtle as well as creating potential oxbow wetland structures at the lower end of UT2.
3. After walking the lower portion of UT2, it was agreed upon that Enhancement I was an appropriate approach for this reach.
4. Tyler felt that Enhancement II would be more appropriate for the entire lower length of UT2A due to the channels established bench and lack of incision.
5. It was agreed upon that the entire wooded length of UT2A and UT3 exhibited suitable channel stability and forested habitat to be considered for preservation (5.0:1.0 ratio due to high quality nature of streams and width of buffer).
6. Matt and Tyler discussed the option to receive a Preliminary Jurisdictional Determination on the entire project site (from Tasha McCormick - USACE); a Final JD would be requested during the 404/401 permitting phase of the project.
7. Although it was not included in the Preliminary Concept Plan, the upstream portion (start of jurisdiction) of UT2 was viewed. WEI will be in further discussion with EEP as to whether or not

this portion of stream will be included in the project. If this area is to be included, Tyler requested that Matt do an additional JD walk and revise the JD figures to include this area, if necessary.

8. It was discussed that Enhancement II would be performed on the streams surrounding the Wetland BB complex. Log structures may be used to provide bed stability in this area.
9. Shawn and Harry discussed as to whether there would be any issues to fencing out the cattle along UT2 early and whether or not full credit would still be received if the project were to be delayed for a year or so and the area was allowed to grow over. Tyler confirmed that full credit would still be received. Shawn thought that fencing could be a constraint to construction and felt it would be best to wait until then.
10. The USACE discussed how to handle restoration/enhancement approaches along the upper portion of UT2. Since the area is comprised of pieces of Enhancement II, Enhancement I and Restoration, rather than breaking these sections out, call the entire reach Enhancement I at a ratio of 1.5:1.0-2.0:1.0. Credit ratios will be proposed in the mitigation plan based on the amount of actual improvements designed.
11. Tyler, Harry, and Shawn reviewed the middle Enhancement II portion of UT2 located within the wider easement area. It was mentioned that in mountain streams with wider easement areas placed on them, a higher ratio of 2.2:1.0 may be received as opposed to 2.5:1.0. Credit ratios will be proposed in the mitigation plan based on the easement width and past precedent. Tyler was to provide an easement width/credit table to Harry.
12. Restoration and Enhancement II was agreed upon for UT2B as shown in the concept plan.
13. The agricultural ditch leading to Wetland FF was discussed as a potential option for Enhancement II. DWQ and USACE both agreed that the best approach would be to fence out cattle and plant the area, performing little to no stream work. The crossing would be maintained at an easement break. WEI will discuss this reach with EEP and whether or not it will be included in the project.
14. Harry brought up concern about a steep gully located near Wetland GG and whether or not this area could be included in the project to provide stabilization or construct treatment for storm runoff from this feature. WEI will discuss this area with EEP in further detail.
15. Little Pine Creek was walked and it was agreed that a restoration approach for most of Little Pine Creek was appropriate, particularly if a Priority 1 can be achieved by catching grade on the new section of Eddy Edwards land just upstream.
16. Harry addressed the option of maintaining existing alignment of Little Pine, stabilization through bio-engineering, and working within the existing channel. We agreed we would discuss the final approach with NCEEP as we enter the design phase of the project.

APPENDIX 5. Historic Aerial Photography

Little Pine Creek III Restoration Project
Big Oak Road
Ennice, NC 28623

Inquiry Number: 3305532.5
April 24, 2012

The EDR Aerial Photo Decade Package

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

Date EDR Searched Historical Sources:

Aerial Photography April 24, 2012

Target Property:

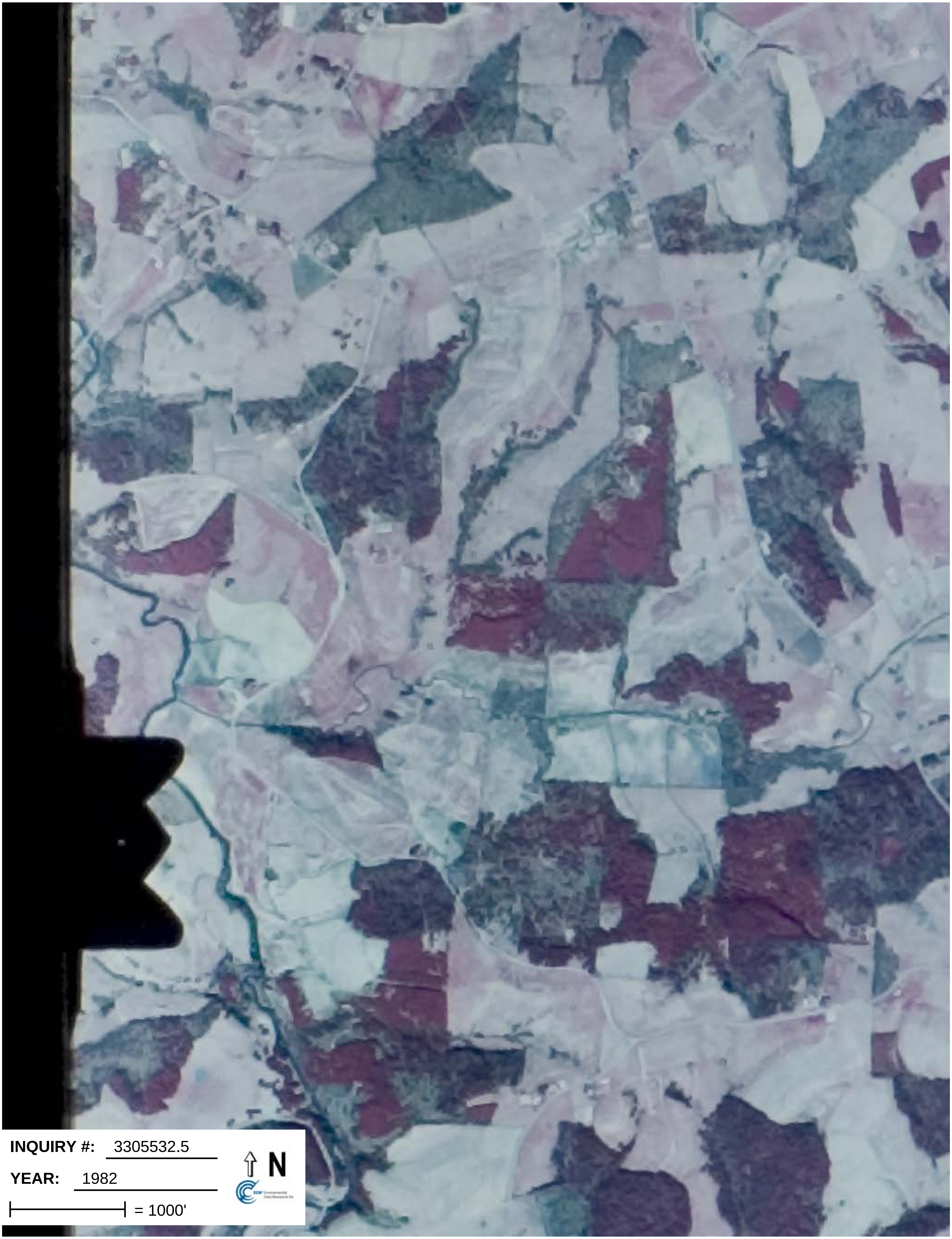
Big Oak Road

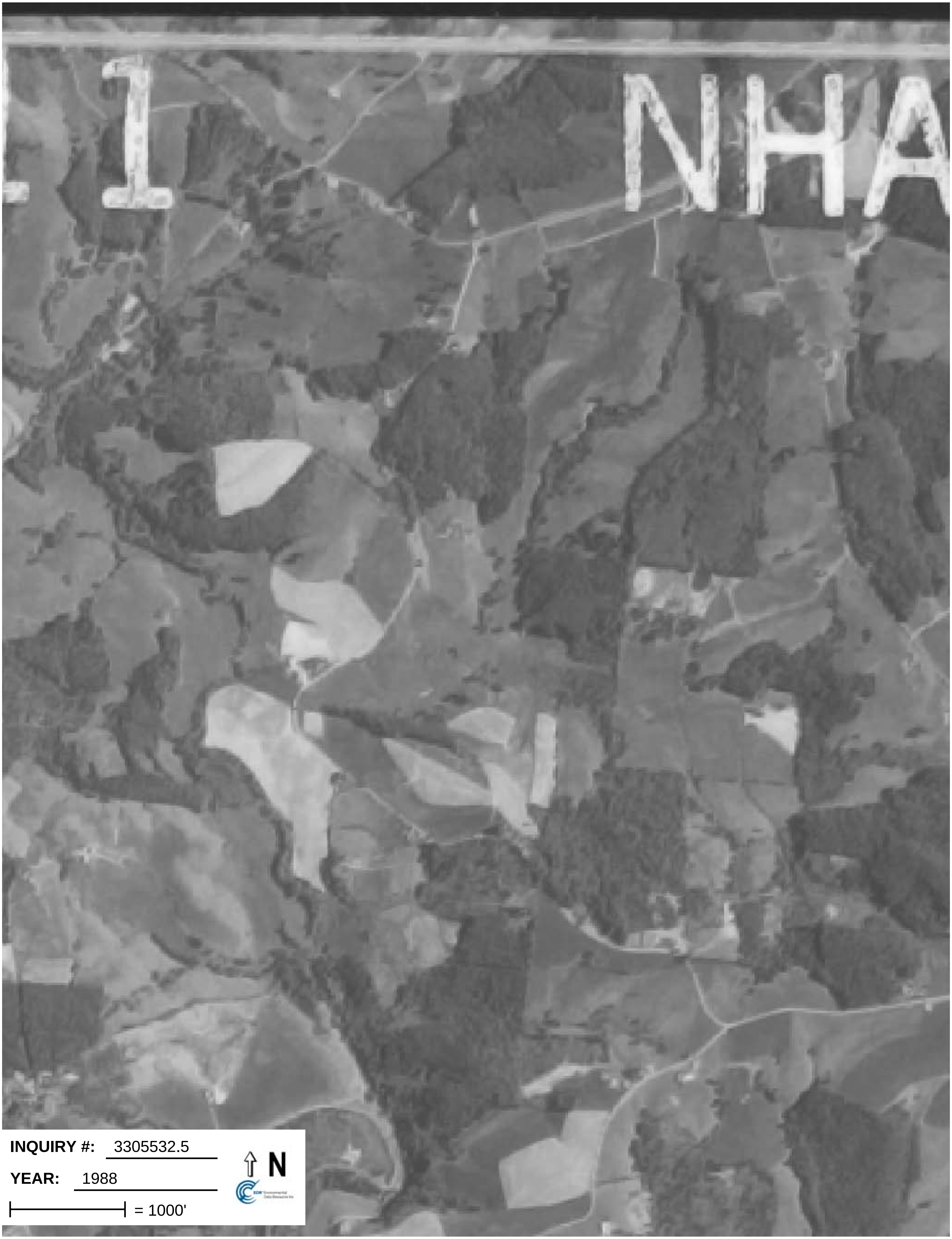
Ennice, NC 28623

Year	***Scale***	***Details***	***Source***
1964	Aerial Photograph. Scale: 1"=750'	Panel #: 36081-E1, Sparta East, NC;/Flight Date: March 16, 1964	EDR
1976	Aerial Photograph. Scale: 1"=1000'	Panel #: 36081-E1, Sparta East, NC;/Flight Date: February 12, 1976	EDR
1982	Aerial Photograph. Scale: 1"=1000'	Panel #: 36081-E1, Sparta East, NC;/Flight Date: April 01, 1982	EDR
1988	Aerial Photograph. Scale: 1"=1000'	Panel #: 36081-E1, Sparta East, NC;/Flight Date: May 26, 1988	EDR
1996,1995	Aerial Photograph. Scale: 1"=500'	Panel #: 36081-E1, Sparta East, NC;/Composite DOQQ - acquisition dates: April 17, 1996,March 24, 1995,March 25, 1995	EDR
1998	Aerial Photograph. Scale: 1"=750'	Panel #: 36081-E1, Sparta East, NC;/Flight Date: March 15, 1998	EDR
2005	Aerial Photograph. Scale: 1"=500'	Panel #: 36081-E1, Sparta East, NC;/Flight Year: 2005	EDR
2006	Aerial Photograph. Scale: 1"=500'	Panel #: 36081-E1, Sparta East, NC;/Flight Year: 2006	EDR
2008	Aerial Photograph. Scale: 1"=500'	Panel #: 36081-E1, Sparta East, NC;/Flight Year: 2008	EDR


INQUIRY #: 3305532.5
YEAR: 1964
= 750'
N


INQUIRY #: 3305532.5
YEAR: 1976
= 1000'
N


INQUIRY #: 3305532.5
YEAR: 1982
= 1000'
N

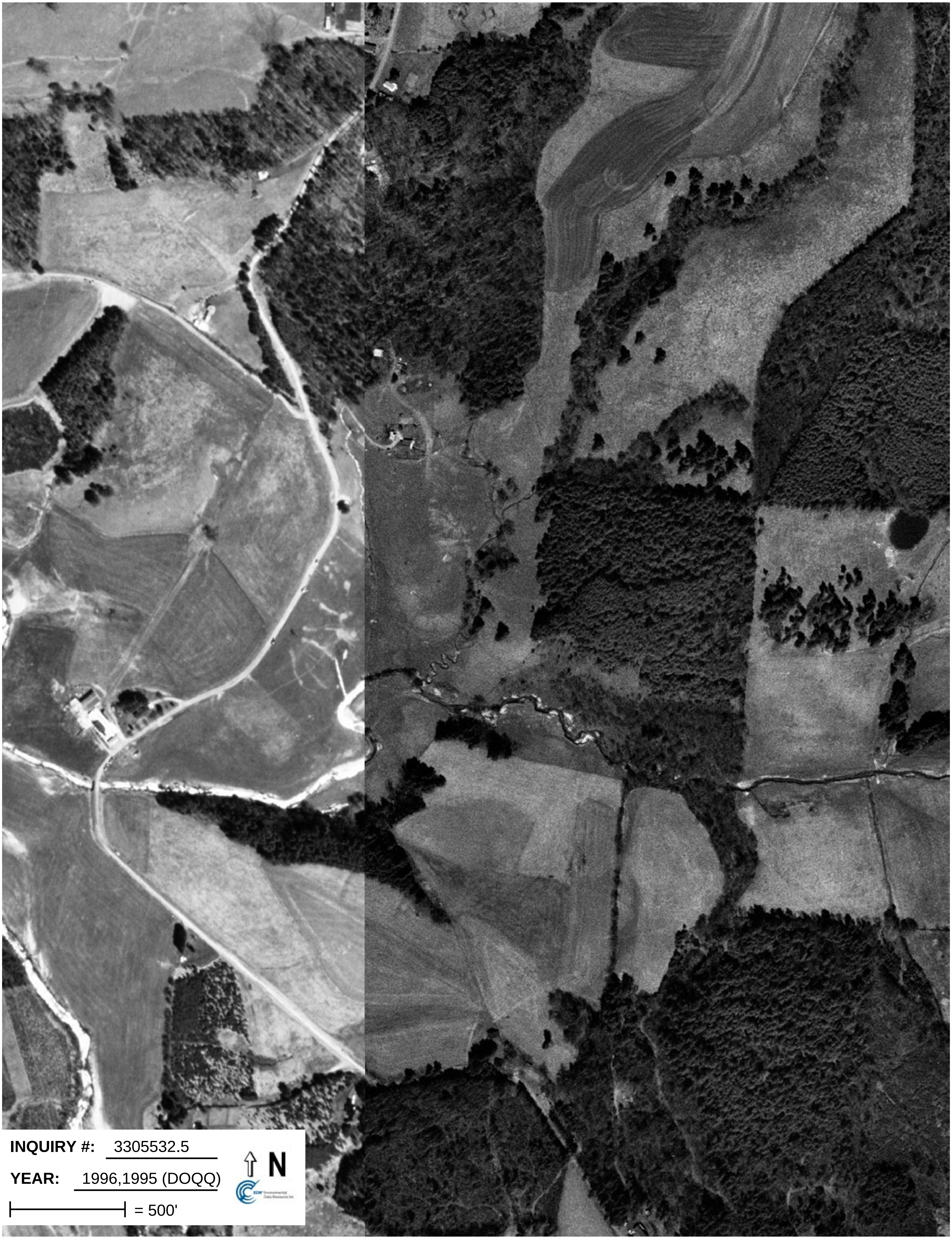


INQUIRY #: 3305532.5

YEAR: 1988

= 1000'

N


INQUIRY #: 3305532.5
YEAR: 1996,1995 (DOQQ)
= 500'
N


INQUIRY #: 3305532.5
YEAR: 1998
= 750'
N


INQUIRY #: 3305532.5
YEAR: 2005
= 500'
N

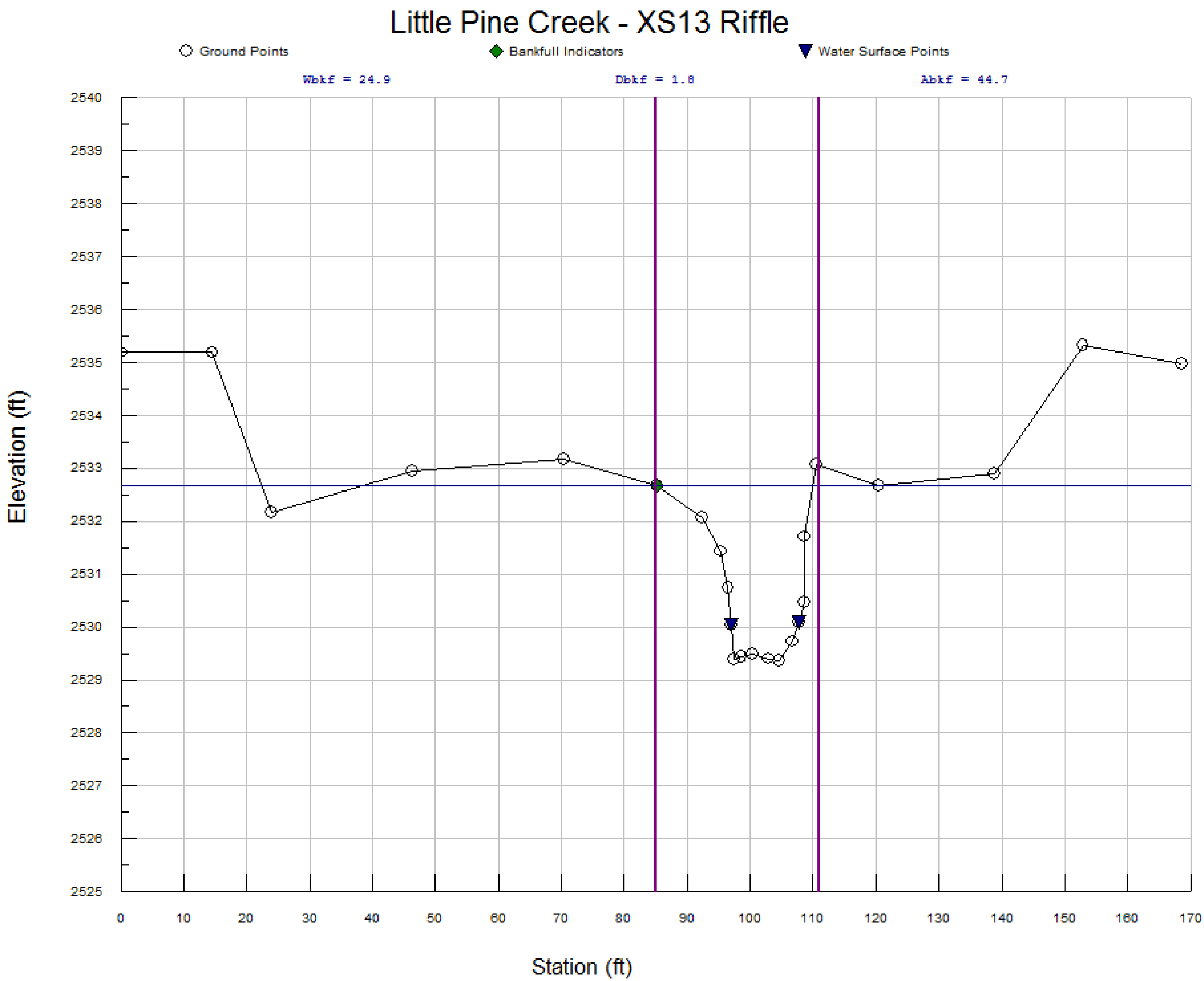

INQUIRY #: 3305532.5
YEAR: 2006
= 500'
N


INQUIRY #: 3305532.5
YEAR: 2008
= 500'
N

APPENDIX 6. Existing Geomorphic Survey Data

Cross Sections Data
Longitudinal Profile Data
Sediment Data
Reference Reach Data

Little Pine Creek – Reach 1


Little Pine Creek - XS13 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 24.9
Dbkf = 1.8
Abkf = 44.7
Elevation (ft)
Station (ft)
2540
2539
2538
2537
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170

Little Pine Reach 1 – XS13, looking downstream

Little Pine Reach 1 – XS13, left bank

Little Pine Reach 1 – XS13, right bank

RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 1 Upper
Cross Section Name: XS13 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2535.187226	riffle
14.55	0	2535.188499	
24.01	0	2532.169796	
46.25	0	2532.939669	
70.44	0	2533.164104	
85.14	0	2532.669369	BKF
92.39	0	2532.061835	
95.31	0	2531.430545	old_bf
96.48	0	2530.739706	
96.97	0	2530.029321	lew
97.41	0	2529.393857	
98.59	0	2529.438683	
100.36	0	2529.493955	
102.92	0	2529.39902	
104.63	0	2529.367786	
106.81	0	2529.728369	
107.76	0	2530.093186	rew
108.6	0	2530.472583	
108.66	0	2531.71026	
110.56	0	2533.081547	
120.49	0	2532.662622	
138.75	0	2532.888679	
152.89	0	2535.314856	
168.5	0	2534.978243	

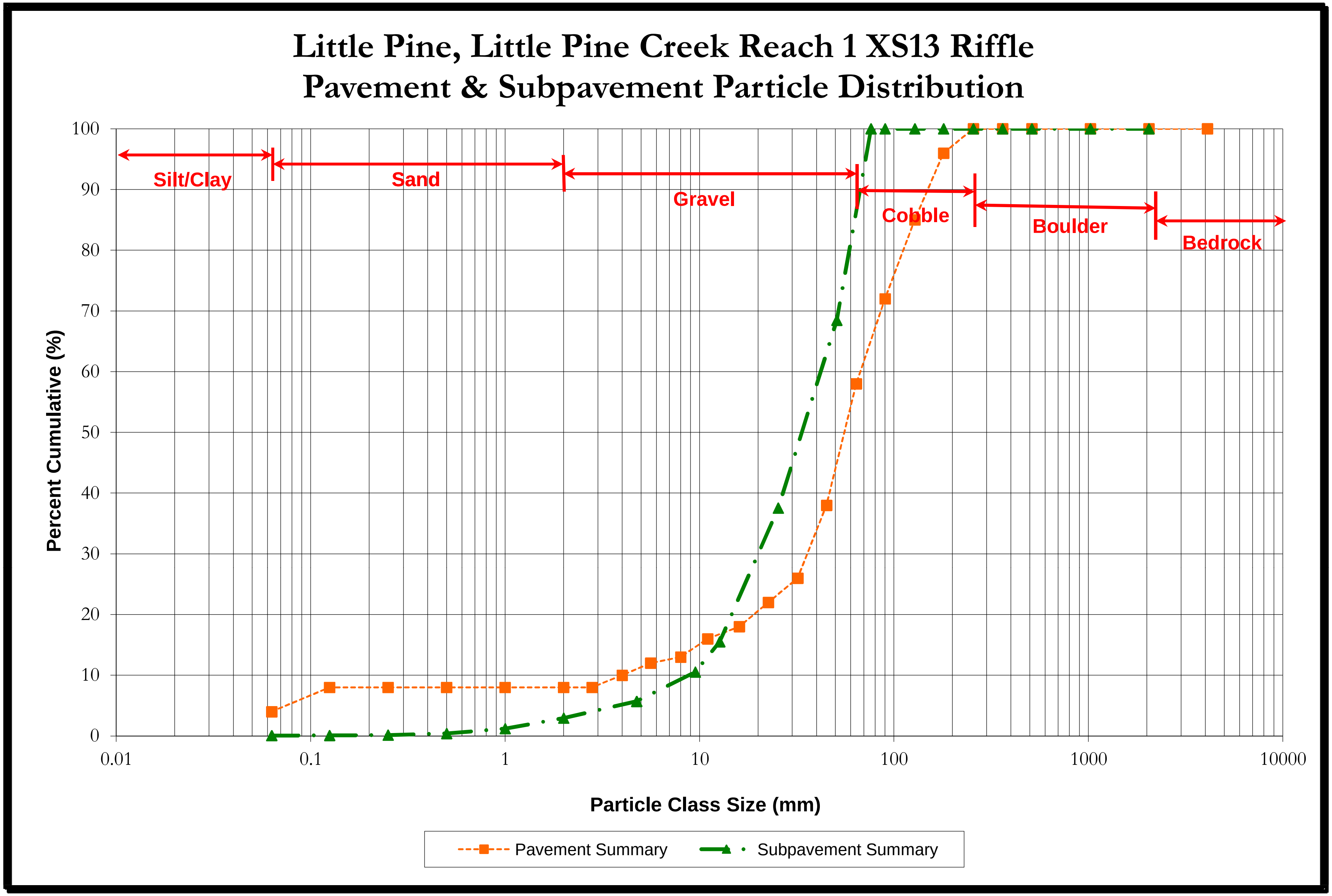
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2535.97	2535.97	2535.97
Bankfull Elevation (ft)	2532.67	2532.67	2532.67
Floodprone Width (ft)	168.5	-----	-----
Bankfull Width (ft)	24.87	16.86	8.01
Entrenchment Ratio	6.78	-----	-----
Mean Depth (ft)	1.8	1.42	2.6
Maximum Depth (ft)	3.3	3.28	3.3
Width/Depth Ratio	13.83	11.9	3.08
Bankfull Area (sq ft)	44.73	23.88	20.84
Wetted Perimeter (ft)	27.53	21.09	12.92
Hydraulic Radius (ft)	1.62	1.13	1.61
Begin BKF Station	85.12	85.12	101.98
End BKF Station	109.99	101.98	109.99

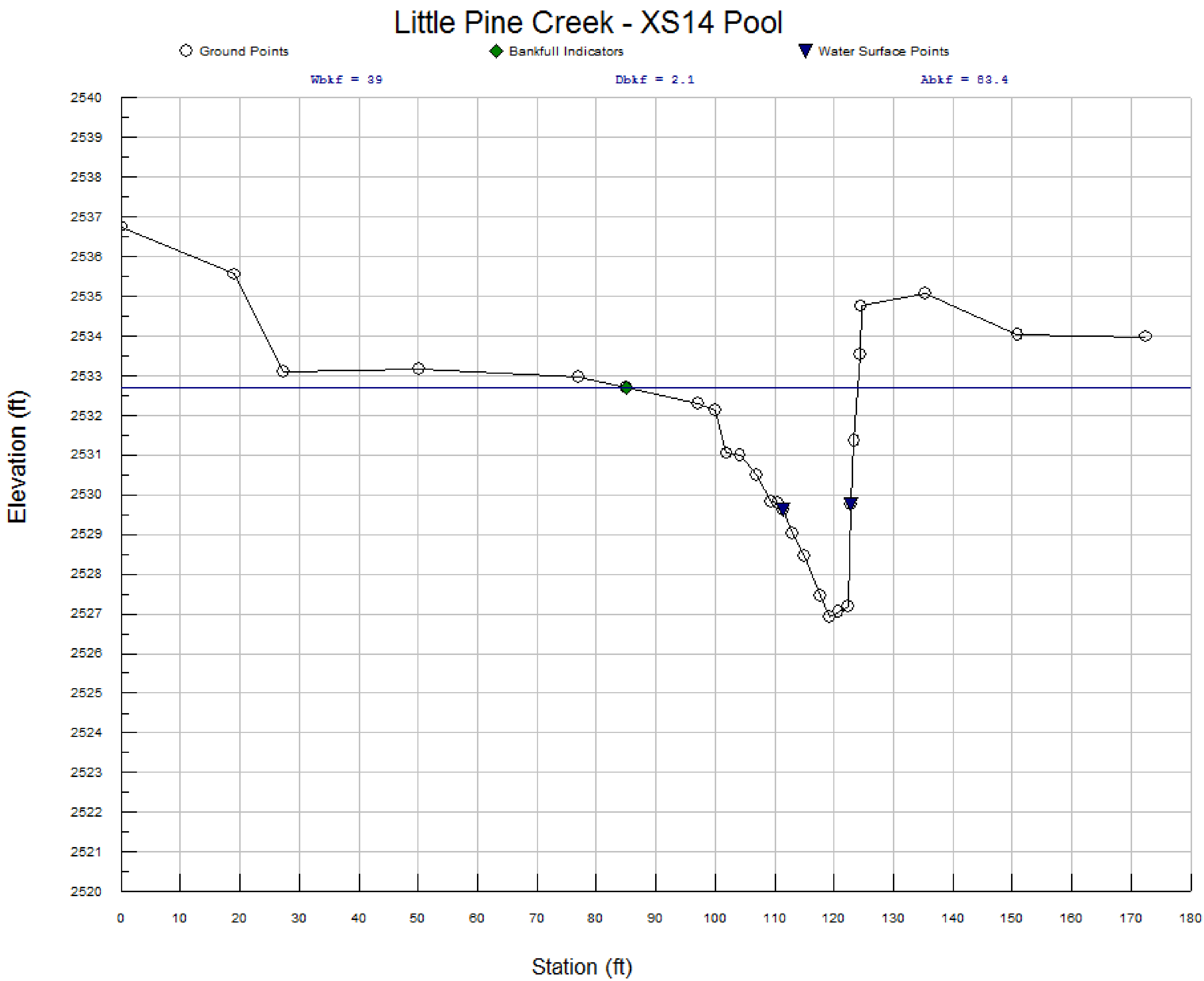
Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine, Little Pine Creek Reach 1 XS13 Riffle
Pavement & Subpavement Particle Distribution
Percent Cumulative (%)
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Pavement Summary
Subpavement Summary



Little Pine Creek - XS14 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 39
Dbkf = 2.1
Abkf = 83.4
Elevation (ft)
Station (ft)
2540
2539
2538
2537
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
2521
2520
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180

Little Pine Reach 1 – XS14, looking downstream

Little Pine Reach 1 – XS14, looking downstream

Little Pine Reach 1 – XS14, right bank

RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 1 Upper
Cross Section Name: XS14 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2536.754622	pool
19.1	0	2535.557372	
27.41	0	2533.11065	
50.15	0	2533.167964	
77.02	0	2532.976671	
85	0	2532.7	BKF
97.19	0	2532.283856	
100.13	0	2532.128248	
101.95	0	2531.04393	
104.19	0	2530.983829	
106.91	0	2530.482223	
109.39	0	2529.825674	
110.63	0	2529.802084	
111.42	0	2529.634209	lew
112.9	0	2529.027164	
114.96	0	2528.464746	
117.74	0	2527.464173	
119.2	0	2526.919164	
120.72	0	2527.042407	
122.43	0	2527.198844	
122.9	0	2529.771737	rew
123.39	0	2531.356768	
124.33	0	2533.548489	
124.53	0	2534.750598	
135.44	0	2535.065497	
150.89	0	2534.030153	
172.43	0	2533.980771	

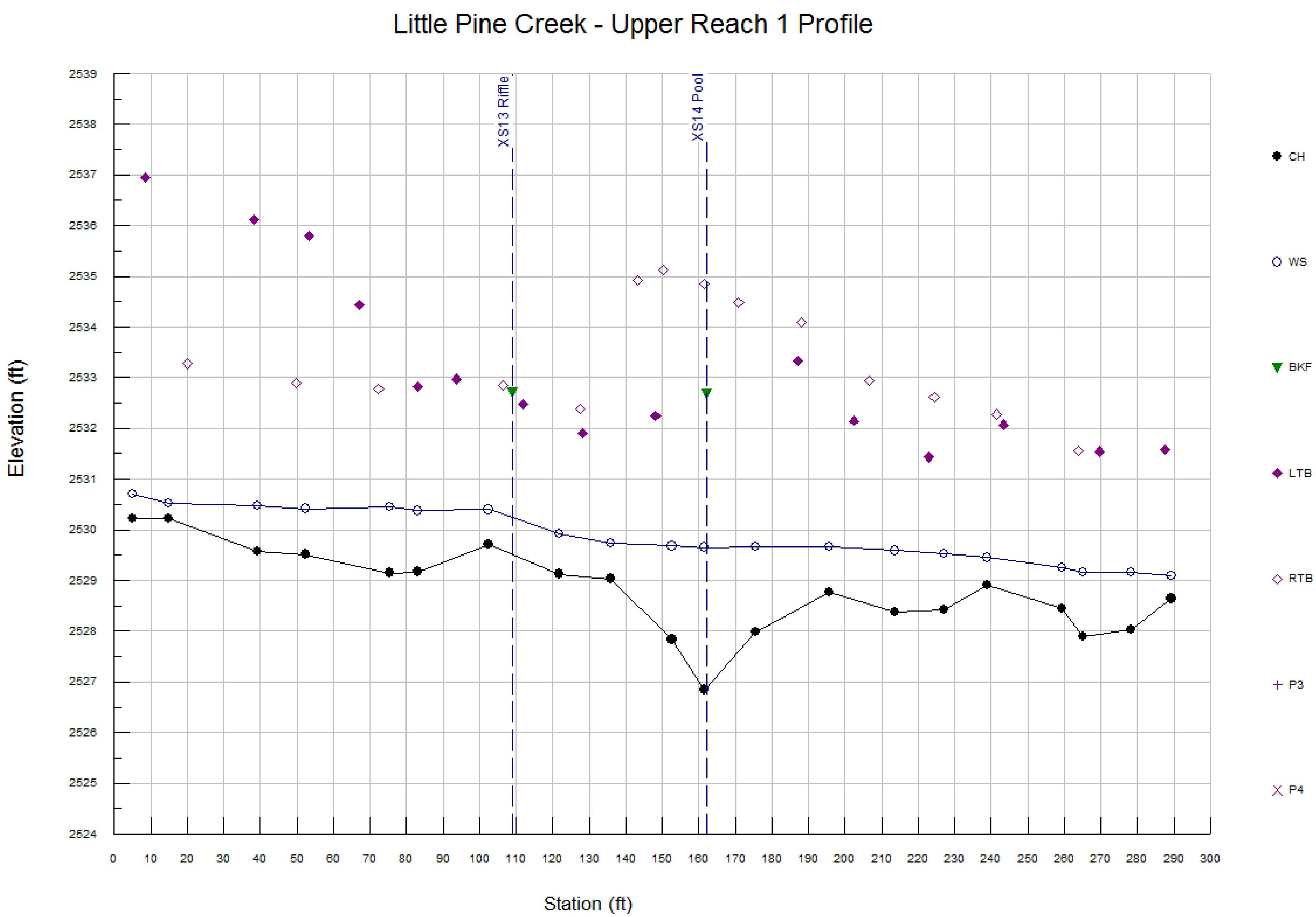
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2538.48	2538.48	2538.48
Bankfull Elevation (ft)	2532.7	2532.7	2532.7
Floodprone Width (ft)	172.43	-----	-----
Bankfull Width (ft)	38.97	27.69	11.28
Entrenchment Ratio	4.43	-----	-----
Mean Depth (ft)	2.14	1.14	4.59
Maximum Depth (ft)	5.78	3.59	5.78
Width/Depth Ratio	18.21	24.25	2.46
Bankfull Area (sq ft)	83.38	31.62	51.76
Wetted Perimeter (ft)	44.11	31.84	19.44
Hydraulic Radius (ft)	1.89	0.99	2.66
Begin BKF Station	85	85	112.69
End BKF Station	123.97	112.69	123.97

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine Creek - Upper Reach 1 Profile
Elevation (ft)
Station (ft)
XS13 Riffle
XS14 Pool
CH
WS
BKF
LTB
RTB
P3
P4
2539
2538
2537
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
290
300

RIVERMORPH PROFILE SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 1 Upper
Profile Name: Profile 1
Survey Date: 05/03/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
4.68					
4.97	2530.223	2530.703			
8.63				2536.94	
15	2530.218	2530.518			
20.06					2533.276
38.18				2536.122	
39.26	2529.579	2530.479			
45.25					
49.87					2532.889
52.3	2529.517	2530.417			
53.23				2535.791	
67.02				2534.431	
68.31					
72.33					2532.772
75.4	2529.152	2530.452			
83.11	2529.173	2530.373			
83.11				2532.829	
93.55				2532.971	
99.95					
102.44	2529.713	2530.393			
106.44					2532.845
109			2532.7		
111.95				2532.478	
116.38					
121.76	2529.125	2529.925			
127.61					2532.387
128.19				2531.9	
135.75	2529.035	2529.735			
142.07					
143.27					2534.928
148.17				2532.255	
150.19					
150.33					2535.126
152.62	2527.84	2529.68			
161.39	2526.845	2529.655			
161.39					2534.849
162			2532.69		
170.92					2534.485
175.25					
175.57	2527.991	2529.671			
181.83					
187.09				2533.325	
187.95					2534.09
195.23					
195.61	2528.768	2529.668			
202.49				2532.147	
206.62					2532.939
213.53	2528.381	2529.591			
215.67					
222.96				2531.43	

224.36					2532.619
227.08	2528.43	2529.54			
238.99	2528.9	2529.45			
241.42					2532.28
243.28				2532.076	
243.59					
259.46	2528.456	2529.256			
261.94					
263.82					2531.562
265.2	2527.89	2529.17			
269.55				2531.546	
278.36	2528.027	2529.167			
287.52				2531.582	
288.7					
289.33	2528.647	2529.087			530.938

Cross Section Locations

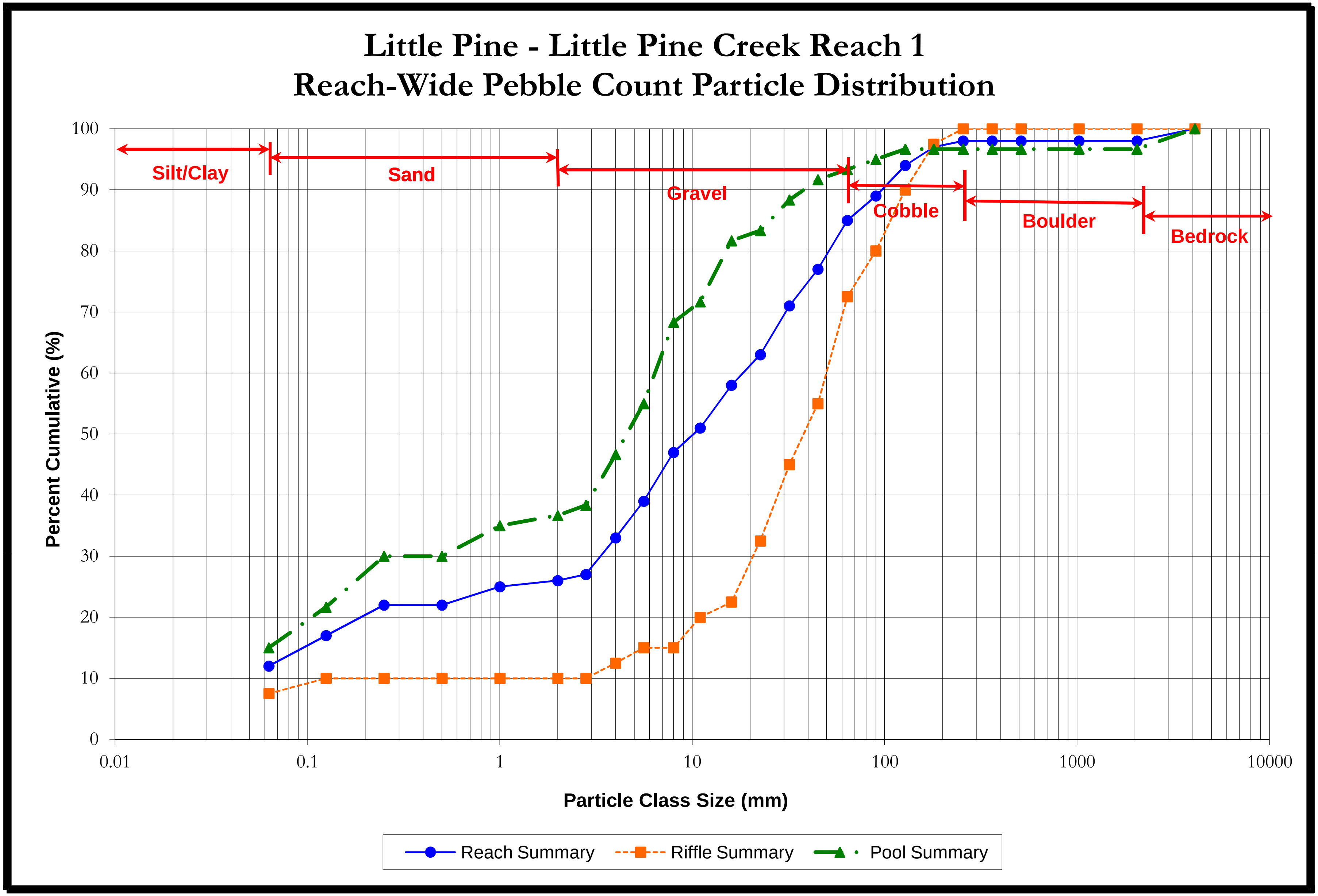
Cross Section Name	Type	Profile Station
XS13 Riffle	Riffle	109.45
XS14 Pool	Pool	162.08

Measurements from Graph

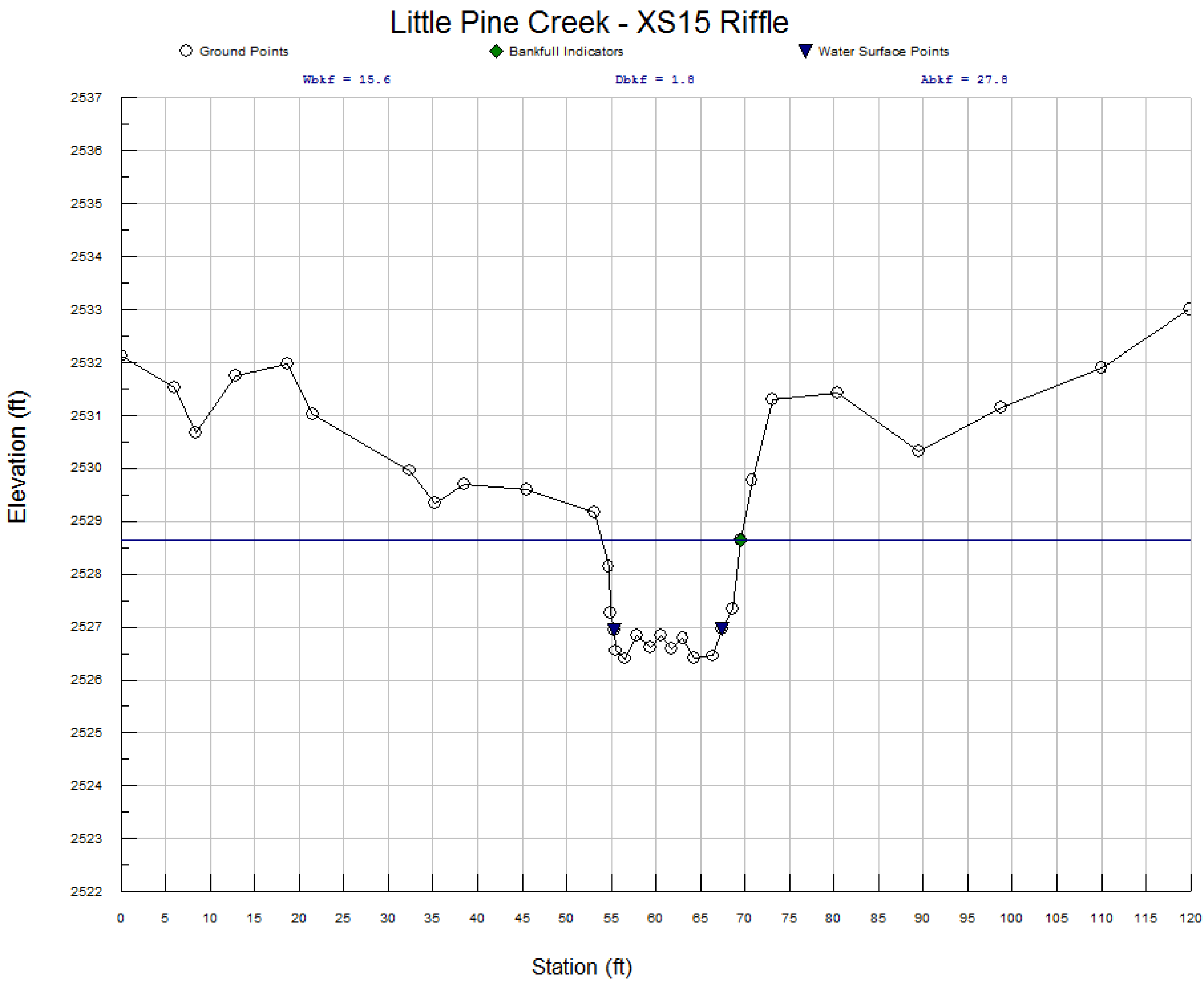
Bankfull Slope: 0.0004

Variable	Min	Avg	Max
S riffle	0.00609	0.0119	0.01958
S pool	0.00038	0.00265	0.00493
S run	0.00318	0.00548	0.00981
S glide	0	0.00409	0.00981
P - P	47.18	63.62	103.64
P length	25.97	39.62	57.51
Dmax riffle	1.83	2.16	2.48
Dmax pool	2.56	3.13	4.2
Dmax run	2.23	2.48	2.75
Dmax glide	2.33	2.54	3.05
Low Bank Ht	2.96	3.25	4.2

Length and depth measurements in feet, slopes in ft/ft.



Little Pine - Little Pine Creek Reach 1
Reach-Wide Pebble Count Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Reach Summary
Riffle Summary
Pool Summary



Little Pine Creek - XS15 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 15.6
Dbkf = 1.8
Abkf = 27.8
Elevation (ft)
Station (ft)
2537
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120


Little Pine Reach 1 – XS15, looking downstream


Little Pine Reach 1 – XS15, left bank


Little Pine Reach 1 – XS15, right bank

XS15 Riffle Summary - Little Pine Creek
RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 1 Lower
Cross Section Name: XS15 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2532.119359	riffle
6.01	0	2531.516679	
8.34	0	2530.680534	
12.87	0	2531.750209	
18.64	0	2531.9746	
21.55	0	2531.026398	
32.38	0	2529.956292	
35.29	0	2529.344033	
38.48	0	2529.693612	
45.58	0	2529.591698	
53.11	0	2529.168931	
54.7	0	2528.141513	-
54.85	0	2527.262162	
55.36	0	2526.930066	lew
55.55	0	2526.550954	
56.52	0	2526.398563	
57.92	0	2526.835398	
59.4	0	2526.610733	
60.51	0	2526.845693	
61.74	0	2526.582795	
63.03	0	2526.780103	
64.26	0	2526.420347	
66.37	0	2526.45527	
67.44	0	2526.967283	rew
68.57	0	2527.347923	
69.5	0	2528.643577	bkf
70.79	0	2529.765175	
73.07	0	2531.302963	
80.36	0	2531.432665	
89.44	0	2530.322406	
98.72	0	2531.142149	
109.98	0	2531.890213	
119.83	0	2533.002965	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2530.88	2530.88	2530.88
Bankfull Elevation (ft)	2528.64	2528.64	2528.64
Floodprone Width (ft)	61.74	-----	-----
Bankfull Width (ft)	15.57	7.99	7.58
Entrenchment Ratio	3.97	-----	-----
Mean Depth (ft)	1.78	1.77	1.8

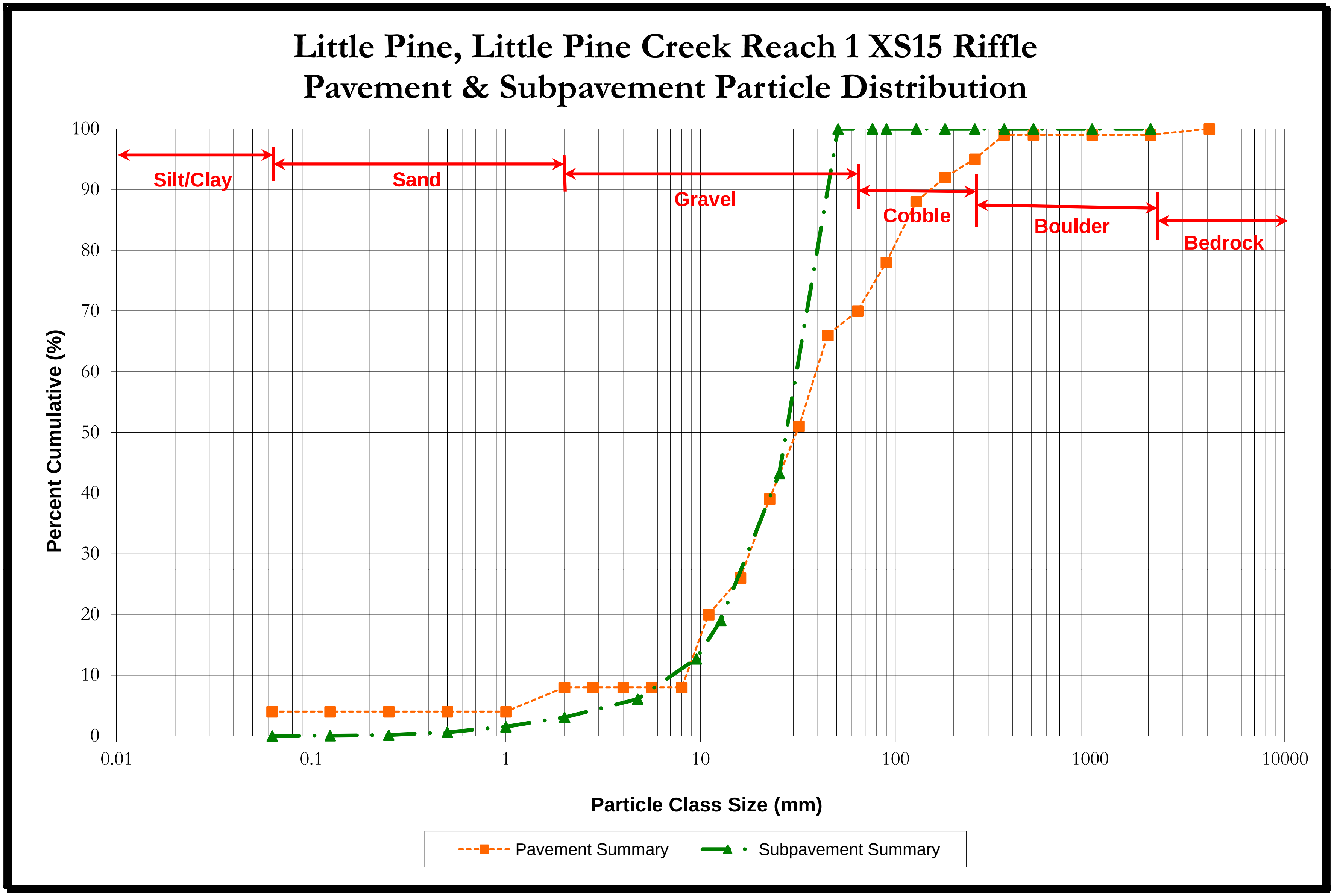
XS15 Riffle Summary - Little Pine Creek

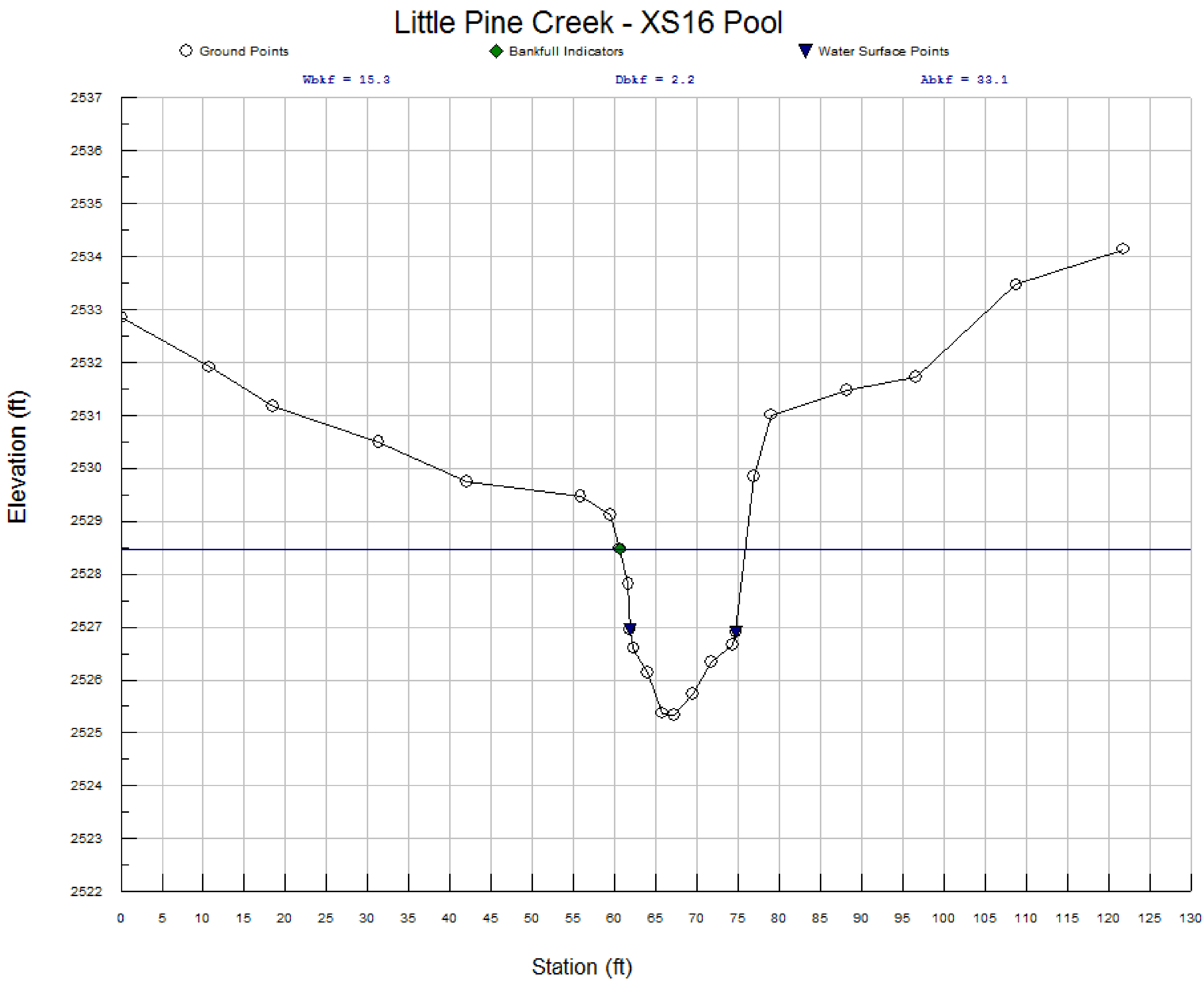
Maximum Depth (ft)	2.24	2.24	2.22
Width/Depth Ratio	8.73	4.53	4.21
Bankfull Area (sq ft)	27.76	14.11	13.65
Wetted Perimeter (ft)	17.85	11.39	10.51
Hydraulic Radius (ft)	1.56	1.24	1.3
Begin BKF Station	53.93	53.93	61.92
End BKF Station	69.5	61.92	69.5

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Little Pine, Little Pine Creek Reach 1 XS15 Riffle
Pavement & Subpavement Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Pavement Summary
Subpavement Summary


Little Pine Creek - XS16 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 15.3
Dbkf = 2.2
Abkf = 33.1
Elevation (ft)
2537
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130
Station (ft)

Little Pine Reach 1 – XS16, looking downstream

Little Pine Reach 1 – XS16, left bank

Little Pine Reach 1 – XS16, right bank

XS16 Pool Summary - Little Pine Creek
RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 1 Lower
Cross Section Name: XS16 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2532.841774	pool
10.79	0	2531.914311	
18.43	0	2531.175169	
31.32	0	2530.492917	
42	0	2529.753207	
55.86	0	2529.464208	
59.51	0	2529.128662	
60.62	0	2528.482441	bkf
61.67	0	2527.821906	-
61.85	0	2526.949375	lew
62.3	0	2526.60044	
63.99	0	2526.139295	
65.85	0	2525.372275	
67.29	0	2525.336488	
69.51	0	2525.748618	
71.72	0	2526.341159	
74.31	0	2526.655231	
74.73	0	2526.902917	rew
76.96	0	2529.854149	
79.07	0	2531.011461	
88.26	0	2531.482767	
96.68	0	2531.726484	
108.82	0	2533.469769	
121.77	0	2534.140142	

Cross Sectional Geometry

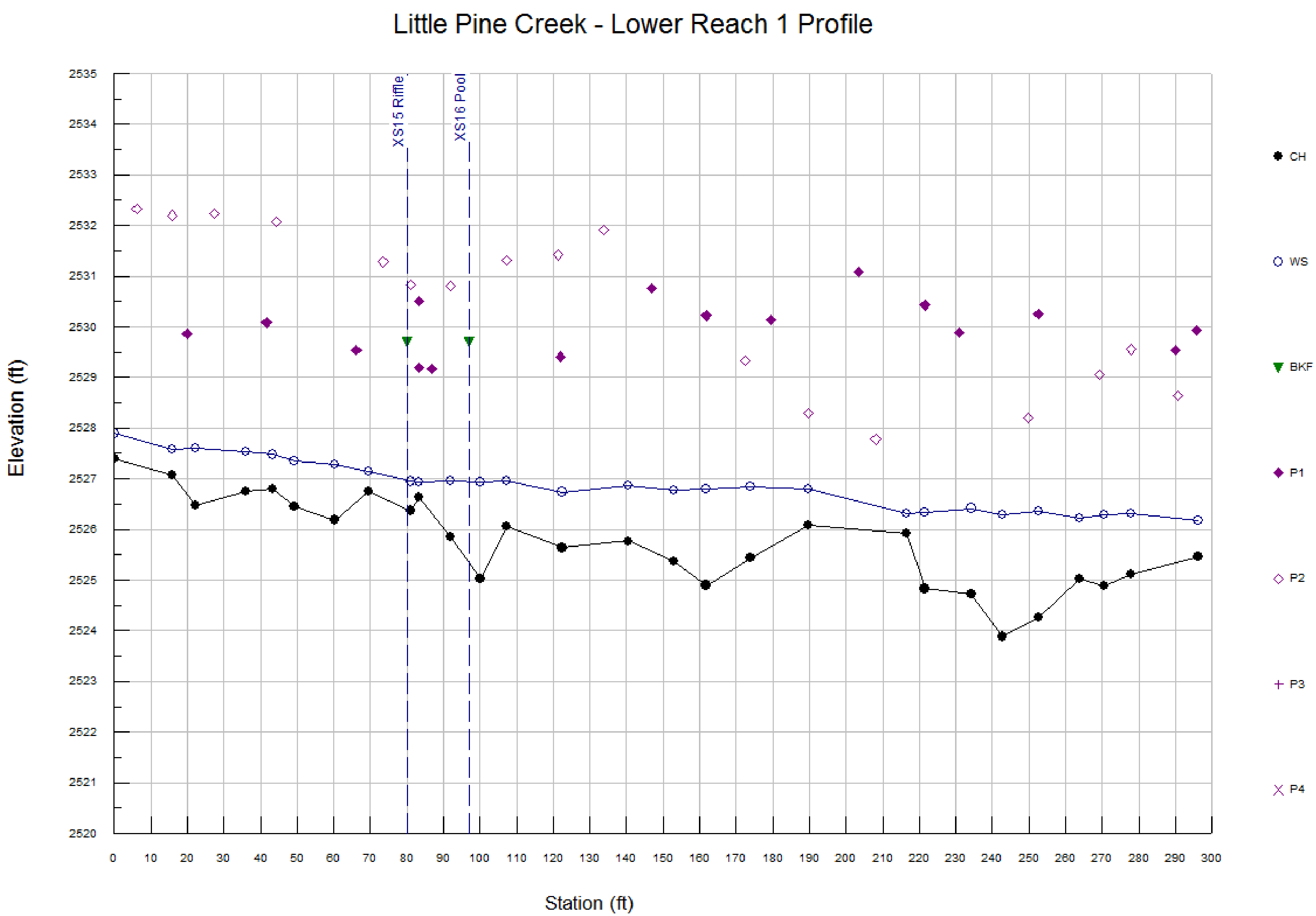
	Channel	Left	Right
Floodprone Elevation (ft)	2531.62	2531.62	2531.62
Bankfull Elevation (ft)	2528.48	2528.48	2528.48
Floodprone Width (ft)	79.33	-----	-----
Bankfull Width (ft)	15.3	7.93	7.37
Entrenchment Ratio	5.19	-----	-----
Mean Depth (ft)	2.17	2.3	2.02
Maximum Depth (ft)	3.14	3.14	2.91
Width/Depth Ratio	7.06	3.44	3.65
Bankfull Area (sq ft)	33.13	18.26	14.88
Wetted Perimeter (ft)	17.52	12.09	11.25
Hydraulic Radius (ft)	1.89	1.51	1.32
Begin BKF Station	60.62	60.62	68.55
End BKF Station	75.92	68.55	75.92

XS16 Pool Summary - Little Pine Creek

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine Creek - Lower Reach 1 Profile
Elevation (ft)
Station (ft)
XS15 Riffle
XS16 Pool
CH
WS
BKF
P1
P2
P3
P4

	
Little Pine Reach 1 – longitudinal profile	Little Pine Reach 1 – longitudinal profile
	
Little Pine Reach 1 – longitudinal profile	Little Pine Reach 1 – longitudinal profile
	
Little Pine Reach 1 – longitudinal profile	Little Pine Reach 1 – longitudinal profile

RIVERMORPH PROFILE SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 1 Lower
Profile Name: Profile 2
Survey Date: 05/04/12

Survey Data

DIST	CH	WS	BKF	P1	P2
0	2527.391	2527.891			
6.12					2532.321
8.21					
15.9	2527.08	2527.58			
15.9					2532.197
19.84				2529.864	
22.25	2526.476	2527.596			
22.69					
27.21					2532.227
33.3					
35.85	2526.746	2527.526			
41.63				2530.08	
43.29	2526.8	2527.48			
44.27					2532.074
49.27	2526.451	2527.351			
58.3					
60.36	2526.188	2527.288			
66.14				2529.534	
69.56	2526.746	2527.146			
73.51					2531.277
80			2529.7		
81.07	2526.368	2526.948			
81.07					2530.835
83.2	2526.629	2526.929			
83.2				2530.502	
83.2				2529.19	
84.29					
86.74				2529.174	
91.98	2525.856	2526.956			
91.98					2530.799
97			2529.7		
100.09	2525.031	2526.931			
102.02					
107.29	2526.059	2526.959			
107.29					2531.315
121.33					2531.418
121.96				2529.413	
122.43	2525.639	2526.739			
125.56					
133.86					2531.903
140.46	2525.771	2526.871			
146.91				2530.757	
152.87	2525.375	2526.775			
161.75	2524.895	2526.795			
161.75				2530.219	
166.07					
172.49					2529.33
173.85	2525.438	2526.838			
179.42				2530.142	
187.56					

189.72	2526.092	2526.792		
189.72				2528.287
203.42			2531.08	
206.72				
208.13				2527.778
216.42	2525.917	2526.317		
221.52	2524.828	2526.328		
221.52			2530.424	
231.04			2529.889	
234.28	2524.717	2526.417		
242.63	2523.884	2526.284		
246.64				
249.79				2528.195
252.49			2530.26	
252.78	2524.257	2526.357		
263.78	2525.023	2526.223		
268.28				
269.25				2529.056
270.62	2524.891	2526.291		
277.87	2525.116	2526.316		
277.87				
277.87				2529.549
290			2529.543	
290.73				2528.642
295.67				
295.79			2529.927	
296.28	2525.467	2526.167		

Cross Section Locations

Cross Section Name	Type	Profile Station
XS15 Riffle	Riffle	79.53
XS16 Pool	Pool	96.79

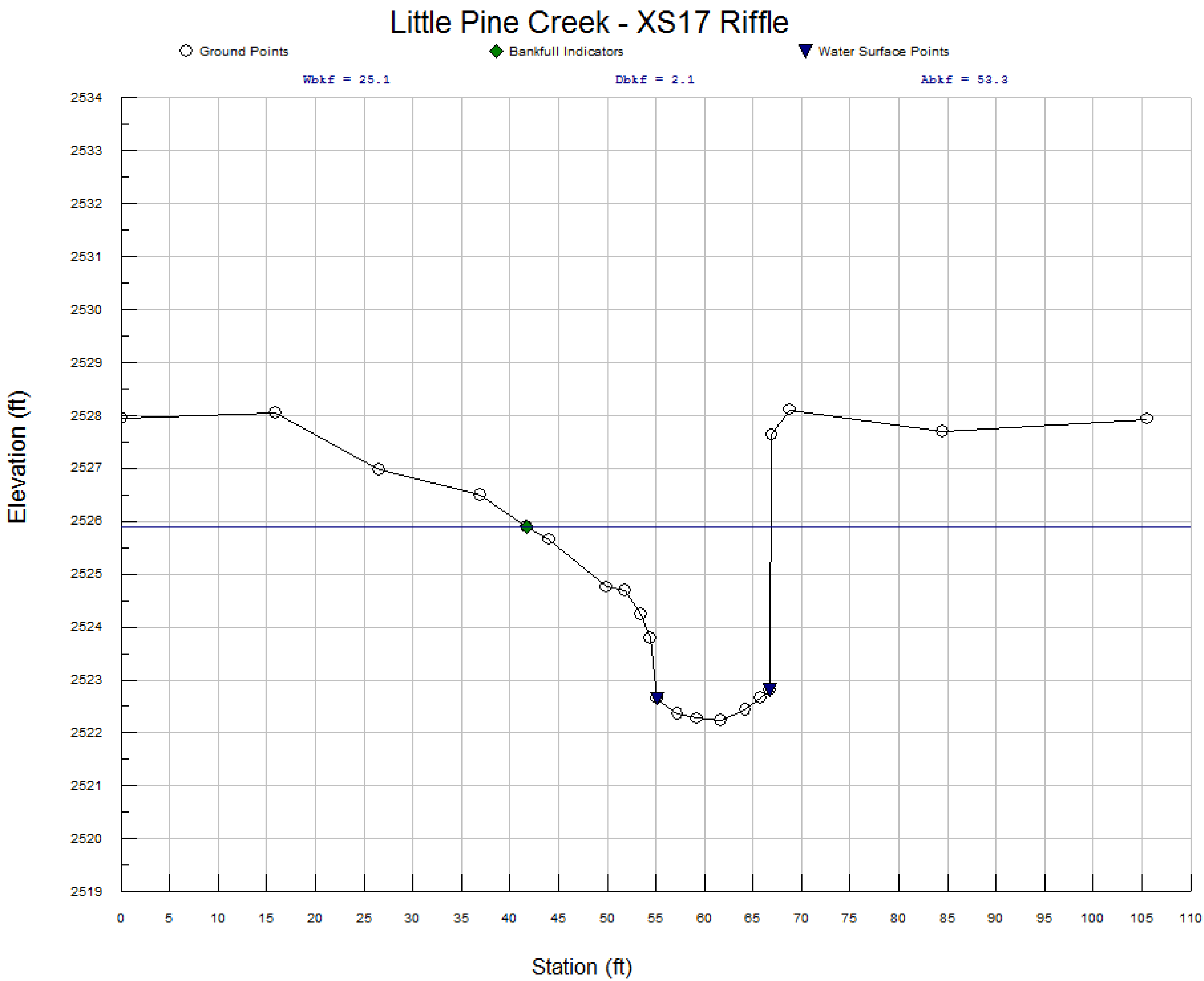
Measurements from Graph

Bankfull Slope: 0.001

Variable	Min	Avg	Max
S riffle	0.01713	0.01902	0.02102
S pool	0.00031	0.00317	0.01057
S run	0.00349	0.00515	0.00686
S glide	0.00069	0.00559	0.01272
P - P	38.77	55.68	81.18
P length	17.73	33.35	58.76
Dmax riffle	1.62	1.93	2.33
Dmax pool	2.56	3.19	3.78
Dmax run	2.21	2.36	2.59
Dmax glide	2.23	2.46	2.82
Low Bank Ht	1.89	2.54	3.19

Length and depth measurements in feet, slopes in ft/ft.

Little Pine Creek – Reach 2A



Little Pine Creek - XS17 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 25.1
Dbkf = 2.1
Abkf = 53.3
Elevation (ft)
Station (ft)
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
2521
2520
2519
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110

Little Pine Reach 2a – XS17, looking downstream

Little Pine Reach 2a – XS17, left bank

Little Pine Reach 2a – XS17, right bank

RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 2A
Cross Section Name: XS17 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2527.947084	riffle
15.89	0	2528.036438	
26.52	0	2526.976831	
36.93	0	2526.500274	
41.72	0	2525.9	BKF
44.02	0	2525.654437	
49.93	0	2524.753761	
51.87	0	2524.682873	old_bf
53.45	0	2524.231687	
54.48	0	2523.797842	
55.06	0	2522.646264	lew
57.23	0	2522.358754	
59.22	0	2522.272375	
61.67	0	2522.247669	
64.2	0	2522.442378	
65.81	0	2522.665006	
66.71	0	2522.80907	rew
66.93	0	2527.636527	
68.8	0	2528.109492	
84.52	0	2527.691073	
105.56	0	2527.935943	

Cross Sectional Geometry

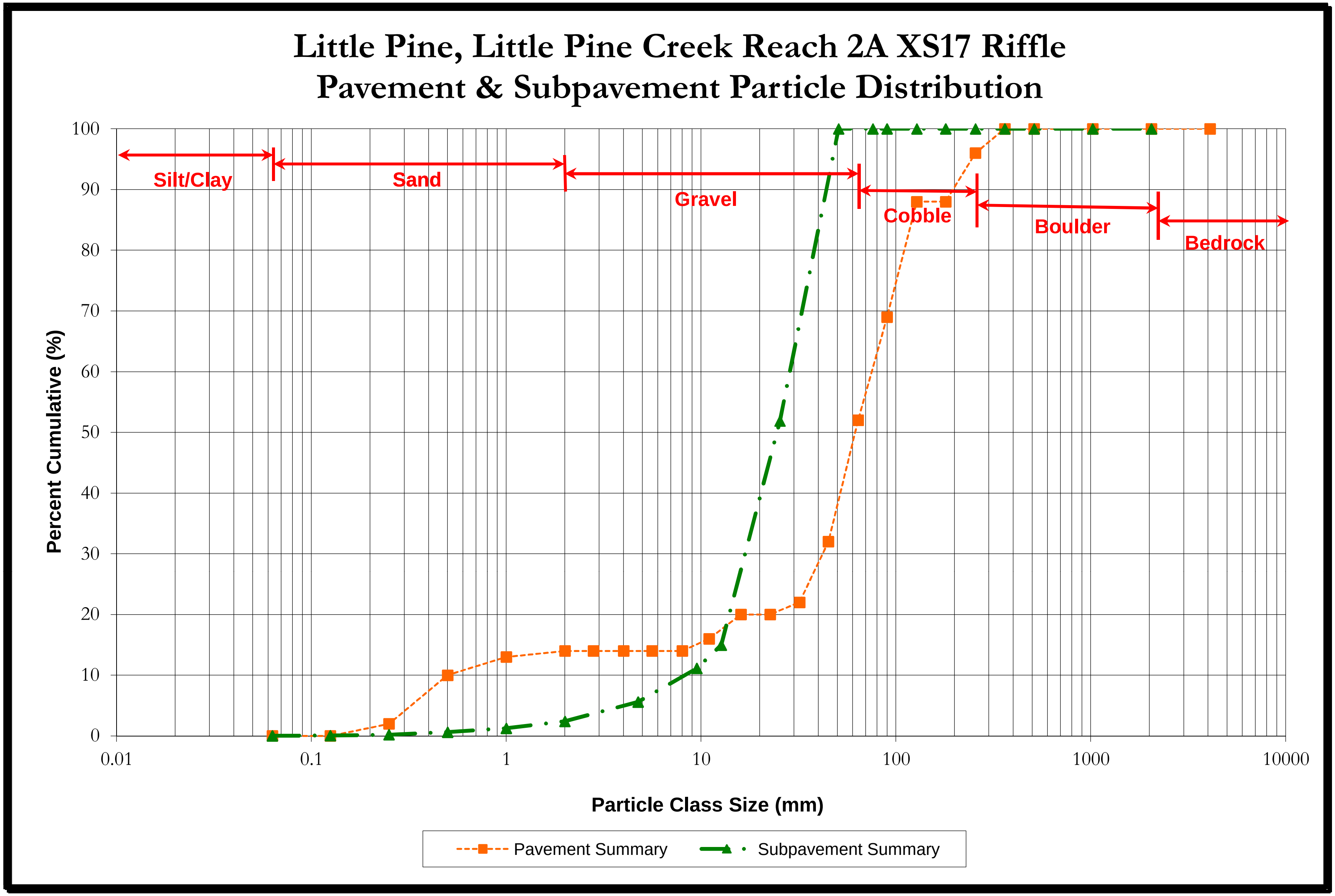
	Channel	Left	Right
Floodprone Elevation (ft)	2529.55	2529.55	2529.55
Bankfull Elevation (ft)	2525.9	2525.9	2525.9
Floodprone Width (ft)	105.56	-----	-----
Bankfull Width (ft)	25.13	17.62	7.51
Entrenchment Ratio	4.2	-----	-----
Mean Depth (ft)	2.12	1.56	3.45
Maximum Depth (ft)	3.65	3.63	3.65
Width/Depth Ratio	11.84	11.33	2.18
Bankfull Area (sq ft)	53.33	27.4	25.93
Wetted Perimeter (ft)	29.08	22.21	14.13
Hydraulic Radius (ft)	1.83	1.23	1.84
Begin BKF Station	41.72	41.72	59.34
End BKF Station	66.85	59.34	66.85

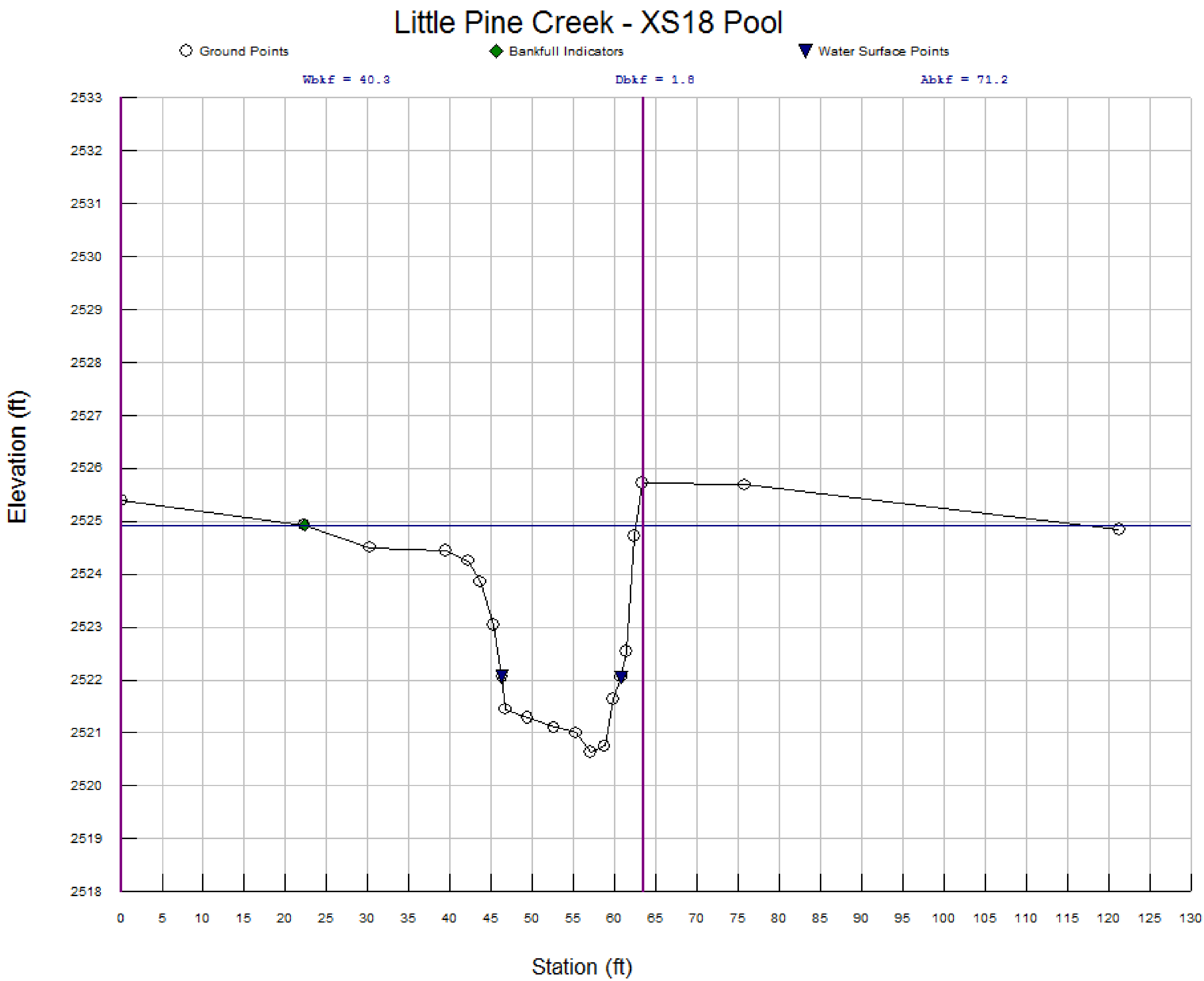
Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side

Slope
Shear Stress (lb/sq ft)
Movable Particle (mm)


Little Pine, Little Pine Creek Reach 2A XS17 Riffle
Pavement & Subpavement Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Pavement Summary
Subpavement Summary



Little Pine Creek - XS18 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 40.3
Dbkf = 1.8
Abkf = 71.2
Elevation (ft)
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
2521
2520
2519
2518
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
Station (ft)

Little Pine Reach 2a – XS18, looking downstream

Little Pine Reach 2a – XS18, left bank

Little Pine Reach 2a – XS18, right bank

RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 2A
Cross Section Name: XS18 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2525.40231	pool
22.29	0	2524.930922	BKF
30.28	0	2524.50217	
39.5	0	2524.437374	old-bf
42.22	0	2524.25375	
43.66	0	2523.85545	old-bf
45.33	0	2523.043482	
46.32	0	2522.066859	lew
46.78	0	2521.449994	
49.4	0	2521.286104	
52.63	0	2521.097628	
55.26	0	2520.997468	
57.11	0	2520.639583	
58.76	0	2520.750784	
59.87	0	2521.632751	
60.83	0	2522.049466	rew
61.42	0	2522.538594	
62.36	0	2524.726864	
63.32	0	2525.712276	
75.81	0	2525.684044	
121.35	0	2524.840695	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2529.22	2529.22	2529.22
Bankfull Elevation (ft)	2524.93	2524.93	2524.93
Floodprone Width (ft)	121.35	-----	-----
Bankfull Width (ft)	40.25	30.51	9.74
Entrenchment Ratio	3.01	-----	-----
Mean Depth (ft)	1.77	1.22	3.49
Maximum Depth (ft)	4.29	3.84	4.29
Width/Depth Ratio	22.75	25.02	2.79
Bankfull Area (sq ft)	71.2	37.22	33.99
Wetted Perimeter (ft)	43.37	35.33	15.72
Hydraulic Radius (ft)	1.64	1.05	2.16
Begin BKF Station	22.31	22.31	52.82
End BKF Station	62.56	52.82	62.56

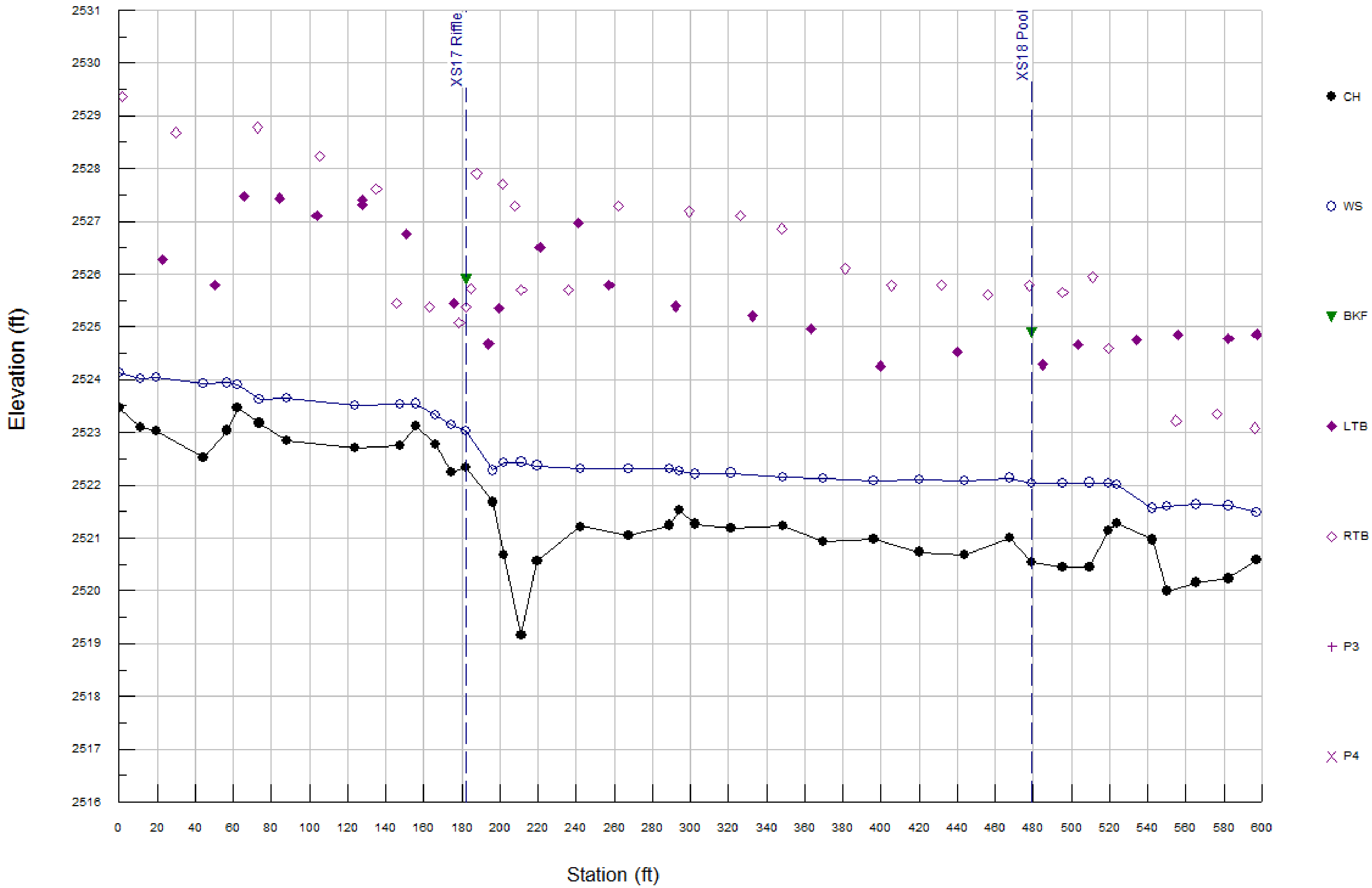
Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side

Slope
Shear Stress (lb/sq ft)
Movable Particle (mm)

Little Pine Creek - Reach 2A Profile



Little Pine Reach 2a – longitudinal profile

Little Pine Reach 2a – longitudinal profile

Little Pine Reach 2a – longitudinal profile

Little Pine Reach 2a – longitudinal profile

Little Pine Reach 2a – longitudinal profile

Little Pine Reach 2a – longitudinal profile

RIVERMORPH PROFILE SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 2A
Profile Name: Profile 1
Survey Date: 05/03/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
0	2523.46	2524.14			
0.57					
1.9					2529.364
11.28	2523.09	2524.02			
16.56					
19.74	2523.034	2524.034			
22.75				2526.274	
29.64					2528.68
38.43					
44.3	2522.52	2523.92			
50.17				2525.788	
56.93	2523.039	2523.939			
62.22	2523.461	2523.911			
62.22					
65.72				2527.465	
72.75					2528.775
73.63	2523.174	2523.624			
84.29				2527.434	
87.88	2522.848	2523.648			
96.1					
103.76				2527.102	
105.12					2528.237
114.84					
123.78	2522.7	2523.52			
127.69				2527.406	
127.82				2527.311	
134.12					
135.05					2527.62
145.45					2525.443
147.52	2522.755	2523.525			
150.99				2526.762	
151.76					
155.76	2523.125	2523.545			
162.78					2525.38
166.29	2522.772	2523.322			
174.33	2522.239	2523.139			
175.84				2525.451	
177.73					
178.52					2525.074
182			2525.9		
182.13	2522.332	2523.032			
182.13					2525.374
184.7					2525.725
187.65					2527.9
193.62					
193.94				2524.674	
196.08	2521.683	2522.283			
199.56				2525.351	
201.2					2527.708
201.89	2520.67	2522.42			

207.67					2527.282
211.17	2519.159	2522.439			
211.17					2525.701
219.57	2520.569	2522.369			
219.57					
220.87				2526.501	
229.93					
233.15					
235.73					2525.694
240.84				2526.972	
242.33	2521.218	2522.318			
257.26				2525.785	
262.13					2527.297
267.51	2521.041	2522.311			
270.23					
289	2521.242	2522.322			
292.22				2525.388	
294.33	2521.53	2522.27			
296.19					
299.31					2527.186
302.26	2521.262	2522.212			
318.2					
321.4	2521.192	2522.232			
326.4					2527.109
332.48				2525.208	
344.78					
348.03					2526.861
348.34	2521.223	2522.153			
363.05				2524.962	
365.96					
369.8	2520.927	2522.127			
381.33					2526.105
396.22	2520.982	2522.082			
399.58				2524.257	
402.91					
405.72					2525.781
417.98					
420.34	2520.732	2522.102			
431.94					2525.792
439.84				2524.527	
439.96					
443.85	2520.683	2522.083			
456.1					2525.603
462.99					
467.7	2520.999	2522.139			
477.59					2525.781
479			2524.9		
479.11	2520.537	2522.037			
484.86				2524.284	
489.54					
495.44	2520.445	2522.045			
495.44					2525.653
503.63				2524.656	
505.33					
509.47	2520.446	2522.046			
511.07					2525.944
519.37	2521.134	2522.034			
519.37					2524.601
524.01	2521.271	2522.021			
525.55					
528.69					
534.41				2524.751	
540.06					
542.53	2520.966	2521.566			
550.32	2519.998	2521.598			
554.92					2523.223

555.79				2524.85	
564.89					
565.55	2520.159	2521.639			
576.36					
576.6					2523.353
582.42	2520.232	2521.612			
582.42				2524.777	
595.61					
596.21					2523.085
597.24	2520.592	2521.492		2524.859	

Cross Section Locations

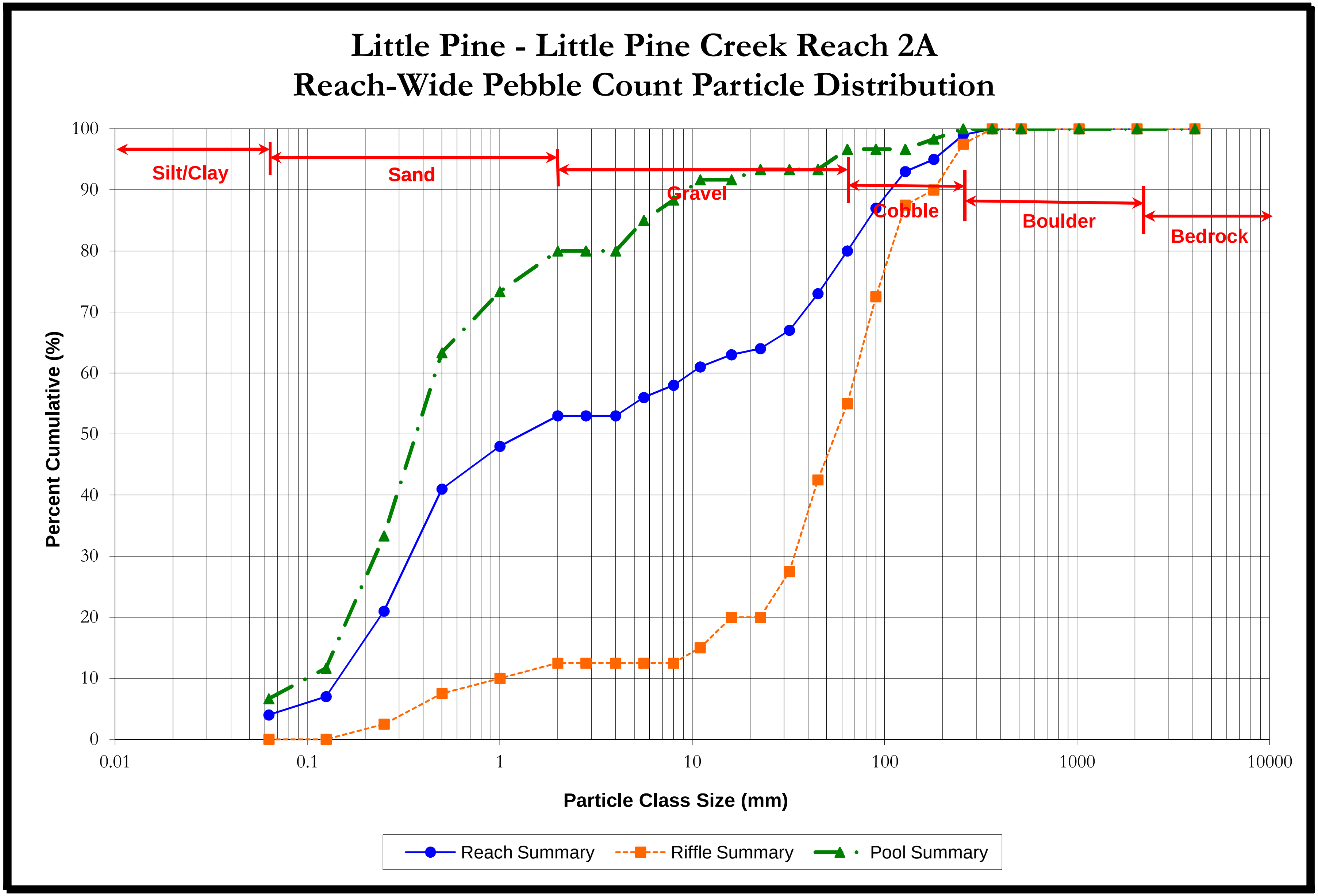
Cross Section Name	Type	Profile Station
XS17 Riffle	Riffle	182.32
XS18 Pool	Pool	479.11

Measurements from Graph

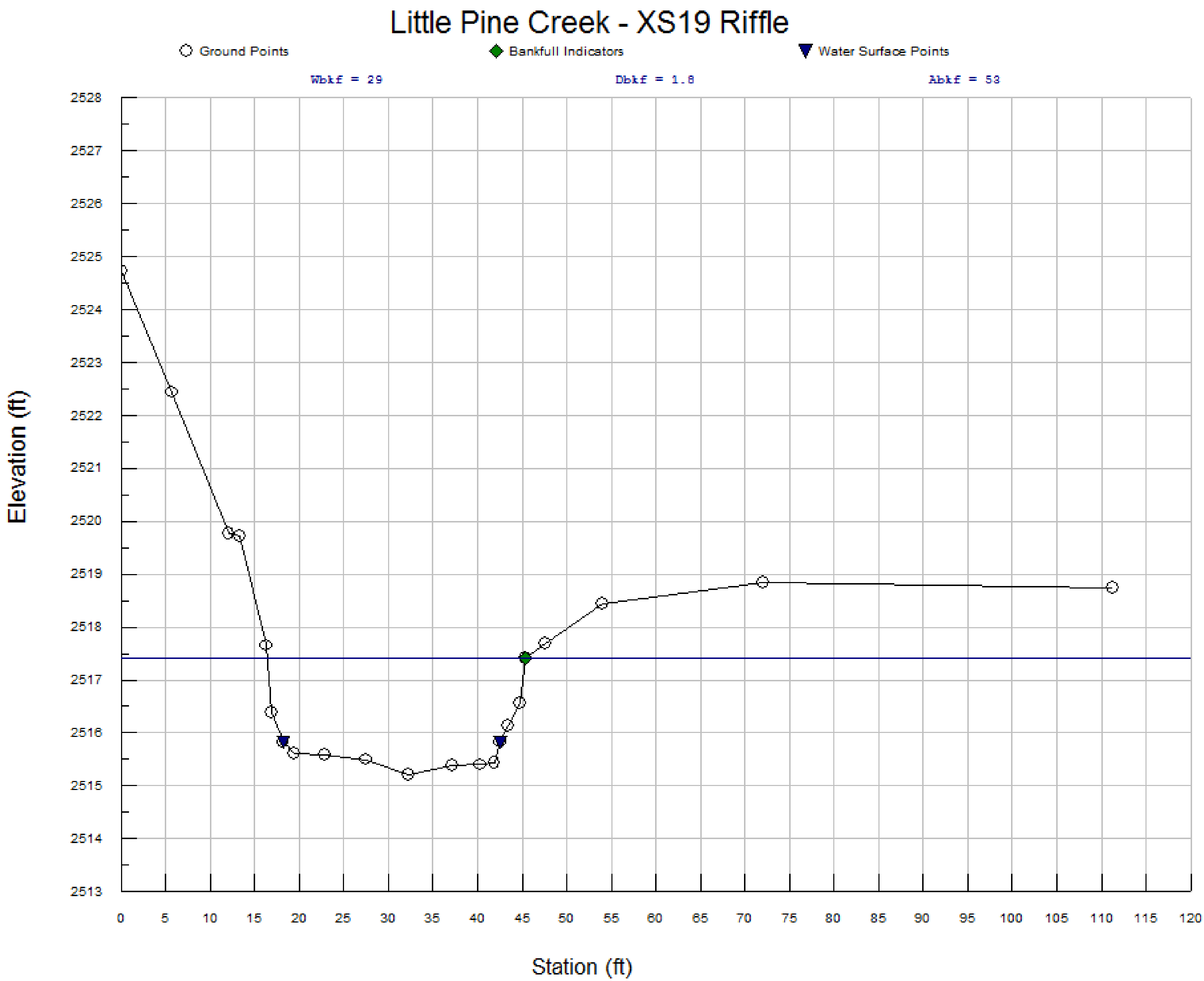
Bankfull Slope: 0.00346

Variable	Min	Avg	Max
S riffle	0.00947	0.02243	0.03071
S pool	0	0.00114	0.002
S run	0.00112	0.00253	0.004
S glide	0	0.00134	0.00327
P - P	54.6	103.05	226.88
P length	41.35	60.11	86.4
Dmax riffle	1.74	2.15	2.5
Dmax pool	2.42	3.33	5.06
Dmax run	2.38	2.57	2.88
Dmax glide	1.93	2.33	2.59
Low Bank Ht	2.1	2.57	3.28

Length and depth measurements in feet, slopes in ft/ft.


Little Pine - Little Pine Creek Reach 2A
Reach-Wide Pebble Count Particle Distribution
Percent Cumulative (%)
Particle Class Size (mm)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Reach Summary
Riffle Summary
Pool Summary

Little Pine Creek – Reach 2B



Little Pine Creek - XS19 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 29
Dbkf = 1.8
Abkf = 53
Elevation (ft)
Station (ft)
2528
2527
2526
2525
2524
2523
2522
2521
2520
2519
2518
2517
2516
2515
2514
2513
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120

Little Pine Reach 2b – XS19, looking downstream

	
Little Pine Reach 2b – XS19, left bank	Little Pine Reach 2b – XS19, right bank

RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 2B
Cross Section Name: XS19 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2524.736617	riffle
5.7	0	2522.436062	
12.07	0	2519.763534	
13.37	0	2519.724054	
16.25	0	2517.651425	
16.91	0	2516.392896	
18.16	0	2515.821795	lew
19.45	0	2515.619591	
22.85	0	2515.590966	
27.46	0	2515.497083	
32.3	0	2515.208429	
37.11	0	2515.383156	
40.37	0	2515.399237	
41.89	0	2515.433344	
42.51	0	2515.82166	rew
43.49	0	2516.133999	
44.78	0	2516.557276	
45.39	0	2517.420278	bkf
47.66	0	2517.689295	
54.03	0	2518.435578	
72.02	0	2518.846522	
111.27	0	2518.743021	

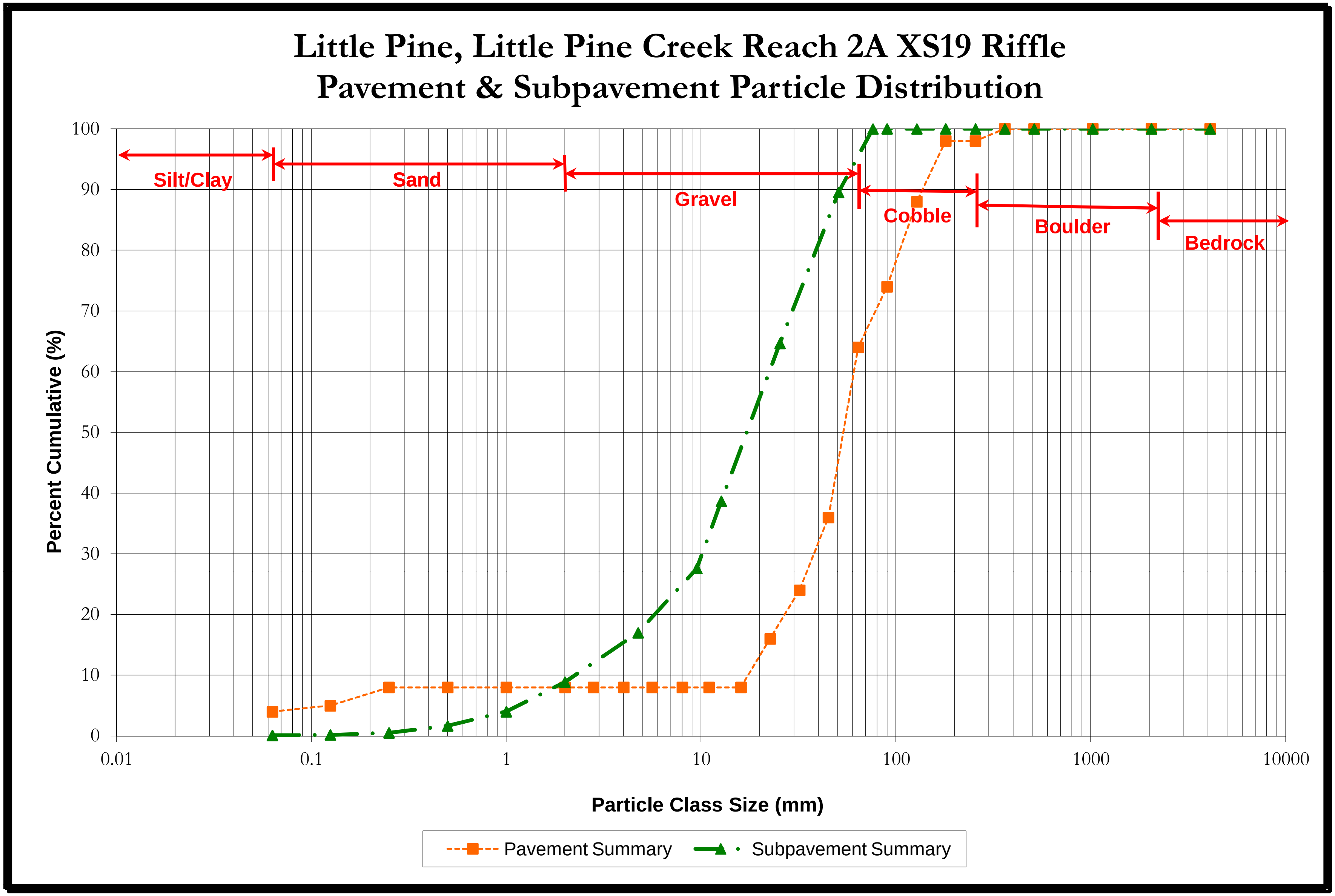
Cross Sectional Geometry

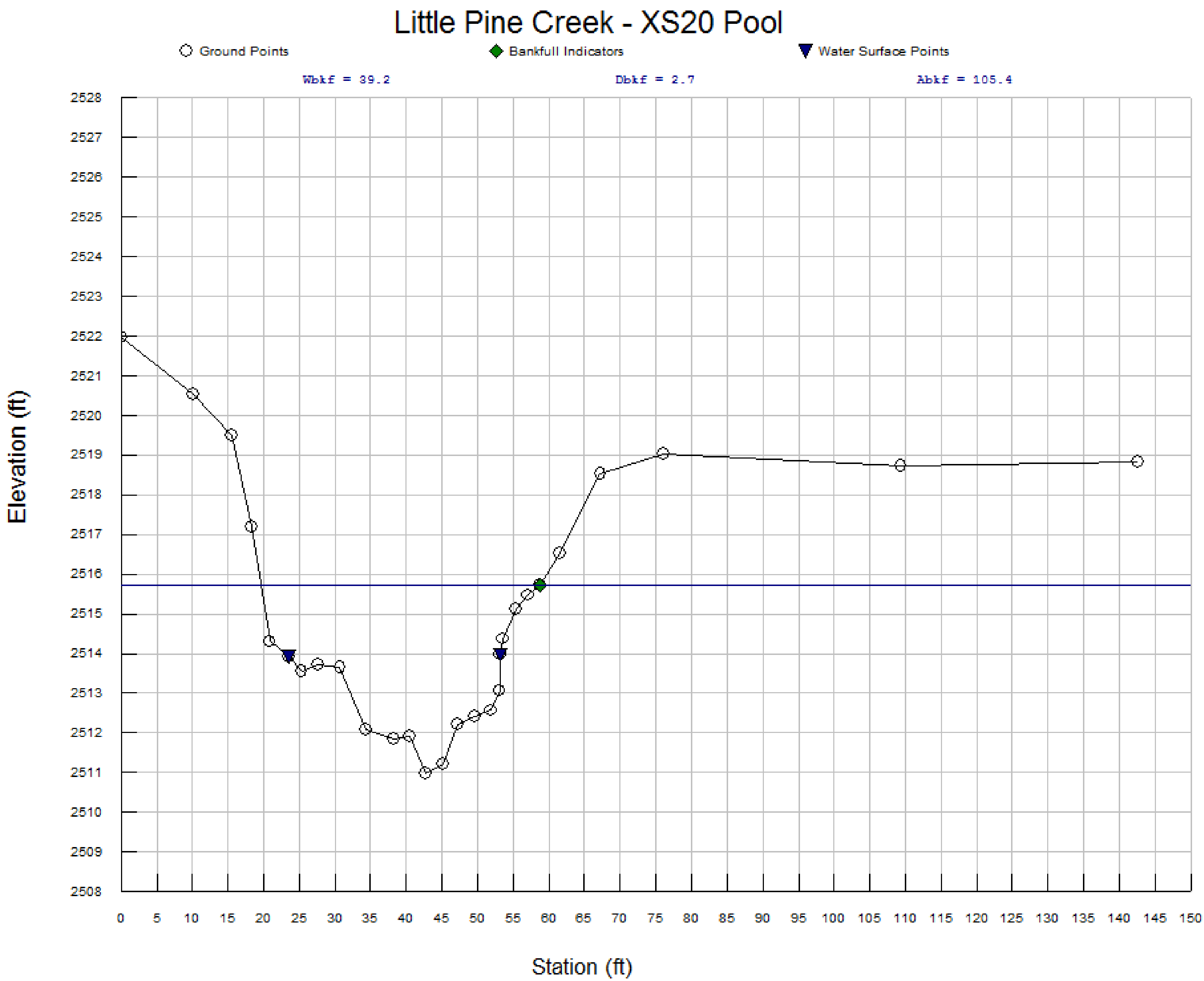
	Channel	Left	Right
Floodprone Elevation (ft)	2519.63	2519.63	2519.63
Bankfull Elevation (ft)	2517.42	2517.42	2517.42
Floodprone Width (ft)	97.77	-----	-----
Bankfull Width (ft)	29.02	14.51	14.51
Entrenchment Ratio	3.37	-----	-----
Mean Depth (ft)	1.83	1.78	1.87
Maximum Depth (ft)	2.21	2.13	2.21
Width/Depth Ratio	15.89	8.14	7.76
Bankfull Area (sq ft)	52.98	25.85	27.13
Wetted Perimeter (ft)	30.47	17.4	17.32
Hydraulic Radius (ft)	1.74	1.49	1.57
Begin BKF Station	16.37	16.37	30.88
End BKF Station	45.39	30.88	45.39

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Little Pine, Little Pine Creek Reach 2A XS19 Riffle
Pavement & Subpavement Particle Distribution
Percent Cumulative (%)
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Pavement Summary
Subpavement Summary


Little Pine Creek - XS20 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 39.2
Dbkf = 2.7
Abkf = 105.4
Elevation (ft)
Station (ft)
2508
2509
2510
2511
2512
2513
2514
2515
2516
2517
2518
2519
2520
2521
2522
2523
2524
2525
2526
2527
2528
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
125
130
135
140
145
150

Little Pine Reach 2b – XS20, looking downstream

Little Pine Reach 2b – XS20, left bank

Little Pine Reach 2b – XS20, right bank

RIVERMORPH CROSS SECTION SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 2B
Cross Section Name: XS20 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2521.957788	pool
10.2	0	2520.537741	
15.49	0	2519.502297	
18.39	0	2517.20451	
20.84	0	2514.300937	
23.6	0	2513.931004	lew
25.31	0	2513.550125	
27.72	0	2513.716405	
30.72	0	2513.641385	
34.3	0	2512.07419	
38.22	0	2511.858517	
40.55	0	2511.915794	
42.78	0	2510.979542	
45.19	0	2511.223981	
47.26	0	2512.220742	
49.64	0	2512.419965	
51.81	0	2512.565709	
53.09	0	2513.065836	
53.2	0	2513.970589	rew
53.62	0	2514.36459	
55.35	0	2515.130043	
57.13	0	2515.475547	
58.79	0	2515.730607	bkf
61.53	0	2516.534497	
67.22	0	2518.530484	
76.09	0	2519.01655	
109.35	0	2518.737481	
142.63	0	2518.838827	

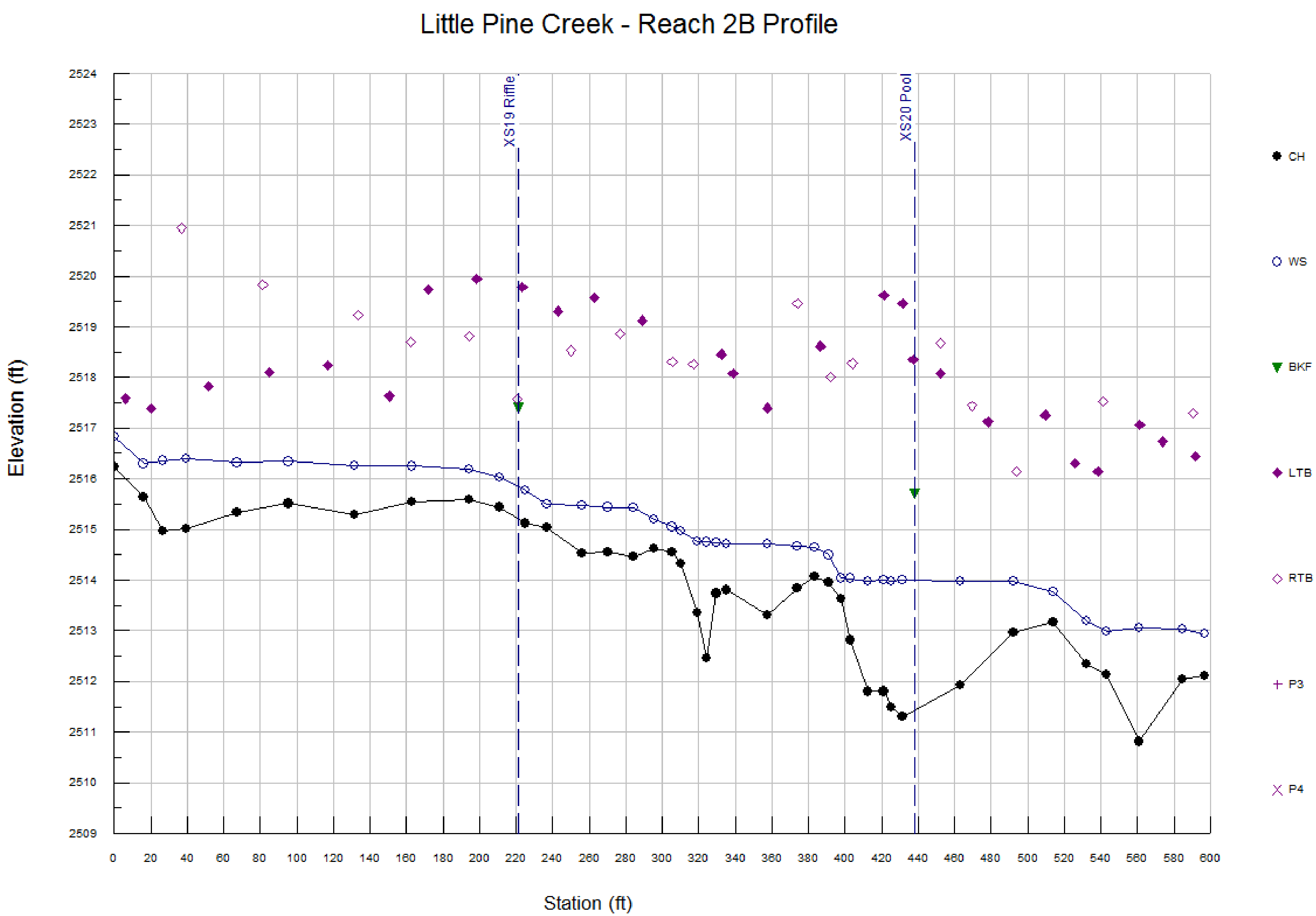
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2520.48	2520.48	2520.48
Bankfull Elevation (ft)	2515.73	2515.73	2515.73
Floodprone Width (ft)	132.14	-----	-----
Bankfull Width (ft)	39.15	19.58	19.58
Entrenchment Ratio	3.37	-----	-----
Mean Depth (ft)	2.69	2.49	2.89
Maximum Depth (ft)	4.75	3.87	4.75
Width/Depth Ratio	14.55	7.86	6.77
Bankfull Area (sq ft)	105.35	48.78	56.57
Wetted Perimeter (ft)	41.93	24.49	25.13
Hydraulic Radius (ft)	2.51	1.99	2.25
Begin BKF Station	19.63	19.63	39.21
End BKF Station	58.79	39.21	58.79

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine Creek - Reach 2B Profile
Elevation (ft)
2524
2523
2522
2521
2520
2519
2518
2517
2516
2515
2514
2513
2512
2511
2510
2509
Station (ft)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
XS19 Riffle
XS20 Pool
CH
WS
BKF
LTB
RTB
P3
P4

RIVERMORPH PROFILE SUMMARY

River Name: Little Pine Creek
Reach Name: Reach 2B
Profile Name: Profile 1
Survey Date: 05/03/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
0	2516.233	2516.833			
5.98				2517.584	
7.99					
16.11	2515.645	2516.295			
20.12				2517.389	
26.51	2514.963	2516.363			
36.25					
36.81					2520.947
39.58	2515.012	2516.392			
51.41				2517.823	
66.18					
67.28	2515.328	2516.318			
81.32					2519.826
84.77				2518.102	
95.29	2515.511	2516.341			
97.97					
116.82				2518.246	
131.32					
131.69	2515.296	2516.256			
133.63					2519.223
149.24					
150.47				2517.631	
162.1					2518.701
162.8	2515.549	2516.249			
171.81				2519.745	
194.33	2515.584	2516.184			
194.33					2518.814
196.45					
198.35				2519.946	
210.92	2515.437	2516.037			
220.47					2517.569
221			2517.4		
223.44				2519.788	
225.09	2515.119	2515.769			
236.82	2515.032	2515.492			
243.01				2519.31	
246.05					
249.96					2518.529
256.1	2514.536	2515.476			
262.62				2519.57	
270.2	2514.561	2515.441			
276.88					2518.858
284.2	2514.464	2515.424			
286.14					
288.93				2519.125	
295.38	2514.621	2515.201			
305.37	2514.562	2515.052			
305.37					2518.304
310.29	2514.324	2514.974			
312.22					

316.88					2518.263
319.34	2513.36	2514.76			
321.52					
324.33	2512.452	2514.752			
329.61	2513.735	2514.735			
332.2				2518.456	
334.95	2513.808	2514.708			
338.67				2518.073	
355.13					
357.26	2513.308	2514.708			
357.62				2517.397	
373.88	2513.847	2514.667			
373.88					2519.462
383.44	2514.069	2514.649			
386.55				2518.616	
391.02	2513.949	2514.499			
392.17					2518.003
395.4					
397.64	2513.637	2514.037			
402.74	2512.813	2514.033			
404.01					2518.276
408.29					
412.66	2511.806	2513.986			
421.24	2511.804	2514.004			
421.24				2519.624	
425.11	2511.486	2513.986			
425.11					
431.43	2511.298	2513.998			
431.43				2519.46	
437.2				2518.352	
438			2515.7		
442.09					
452.3					2518.671
452.32				2518.082	
463.26	2511.92	2513.97			
469.26					2517.443
472.96					
478.21				2517.123	
492.2	2512.96	2513.98			
493.7					2516.141
502.67					
509.52				2517.26	
513.98	2513.172	2513.772			
525.77				2516.303	
532.03	2512.345	2513.195			
538.35				2516.144	
541.4					2517.521
543.22					
543.28	2512.138	2512.988			
560.98	2510.81	2513.06			
561.3				2517.062	
573.42					
574.04				2516.73	
584.9	2512.038	2513.028			
590.31					2517.291
591.5				2516.434	
596.58	2512.118	2512.938			

Cross Section Locations

Cross Section Name	Type	Profile Station
XS19 Riffle	Riffle	220.94
XS20 Pool	Pool	437.82

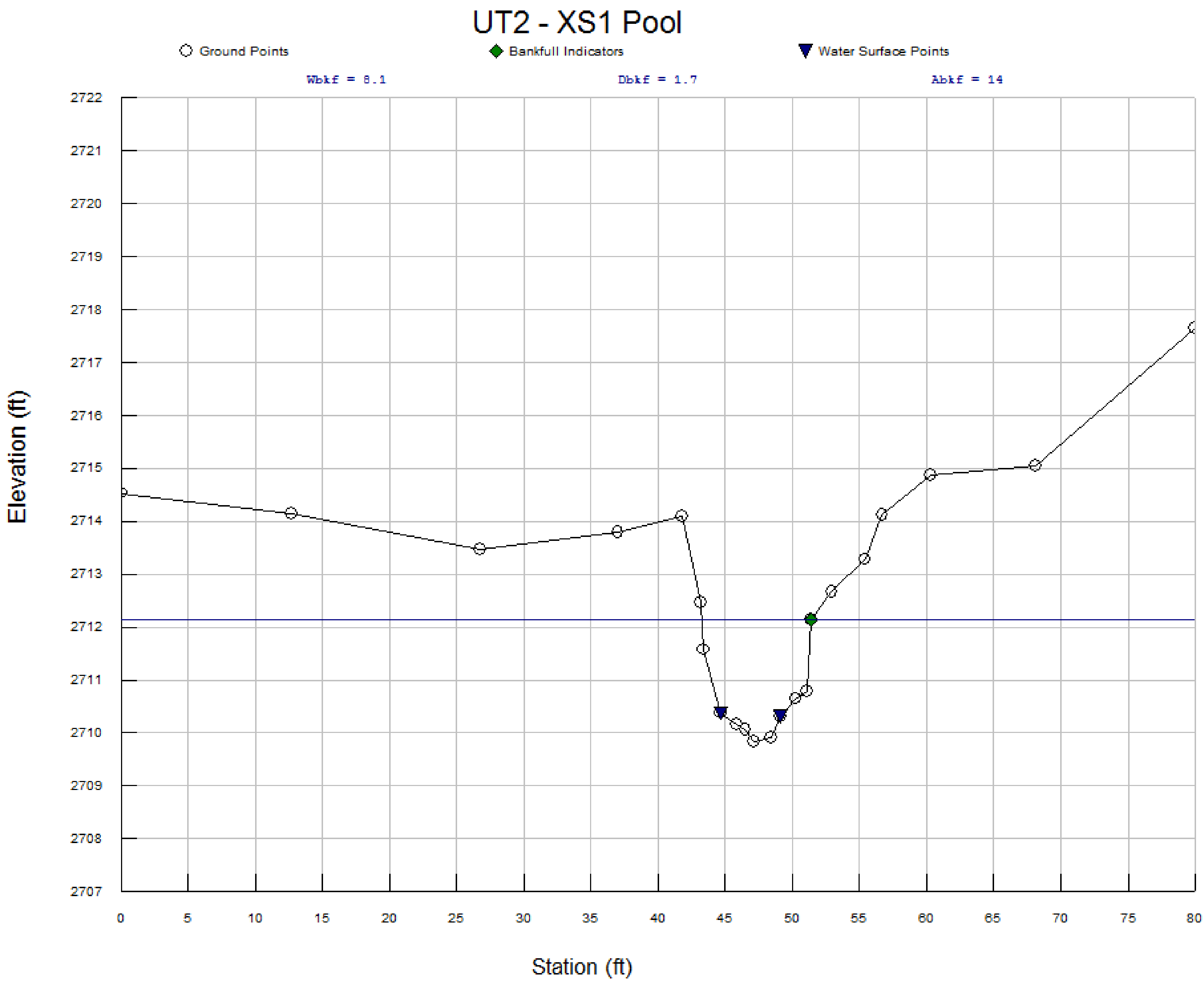
Measurements from Graph

Bankfull Slope: 0.00771

Variable	Min	Avg	Max
S riffle	0.01489	0.02834	0.04462
S pool	0	0.00123	0.00236
S run	0.00189	0.01082	0.02034
S glide	0.0009	0.00233	0.00496
P - P	69.27	133.98	228.63
P length	115.1	178.29	298.42
Dmax riffle	1.83	2.16	2.44
Dmax pool	2.5	3.59	4.54
Dmax run	2.17	2.38	2.71
Dmax glide	2.17	2.56	2.92
Low Bank Ht	1.37	2.09	2.52

Length and depth measurements in feet, slopes in ft/ft.

UT2 – Reach 1



UT2 - XS1 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 8.1
Dbkf = 1.7
Abkf = 14
Elevation (ft)
2722
2721
2720
2719
2718
2717
2716
2715
2714
2713
2712
2711
2710
2709
2708
2707
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
Station (ft)

UT2 Reach 1 – XS1, looking downstream

UT2 Reach 1 – XS1, left bank

UT2 Reach 1 – XS1, right bank

XS1 Pool Summary - UT2

RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Upper Reach 1
Cross Section Name: XS1 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2714.53196	pool
12.68	0	2714.147637	
26.75	0	2713.460597	
37	0	2713.802669	
41.77	0	2714.091522	
43.15	0	2712.46724	
43.41	0	2711.576414	
44.68	0	2710.372924	lew
45.84	0	2710.171071	
46.49	0	2710.069024	
47.18	0	2709.828836	
48.4	0	2709.912076	
49.1	0	2710.31838	rew
50.25	0	2710.646739	
51.11	0	2710.789255	
51.37	0	2712.139412	bkf
52.93	0	2712.669795	
55.42	0	2713.283496	
56.68	0	2714.112212	
60.33	0	2714.870552	
68.12	0	2715.044851	
80.01	0	2717.652625	

Cross Sectional Geometry

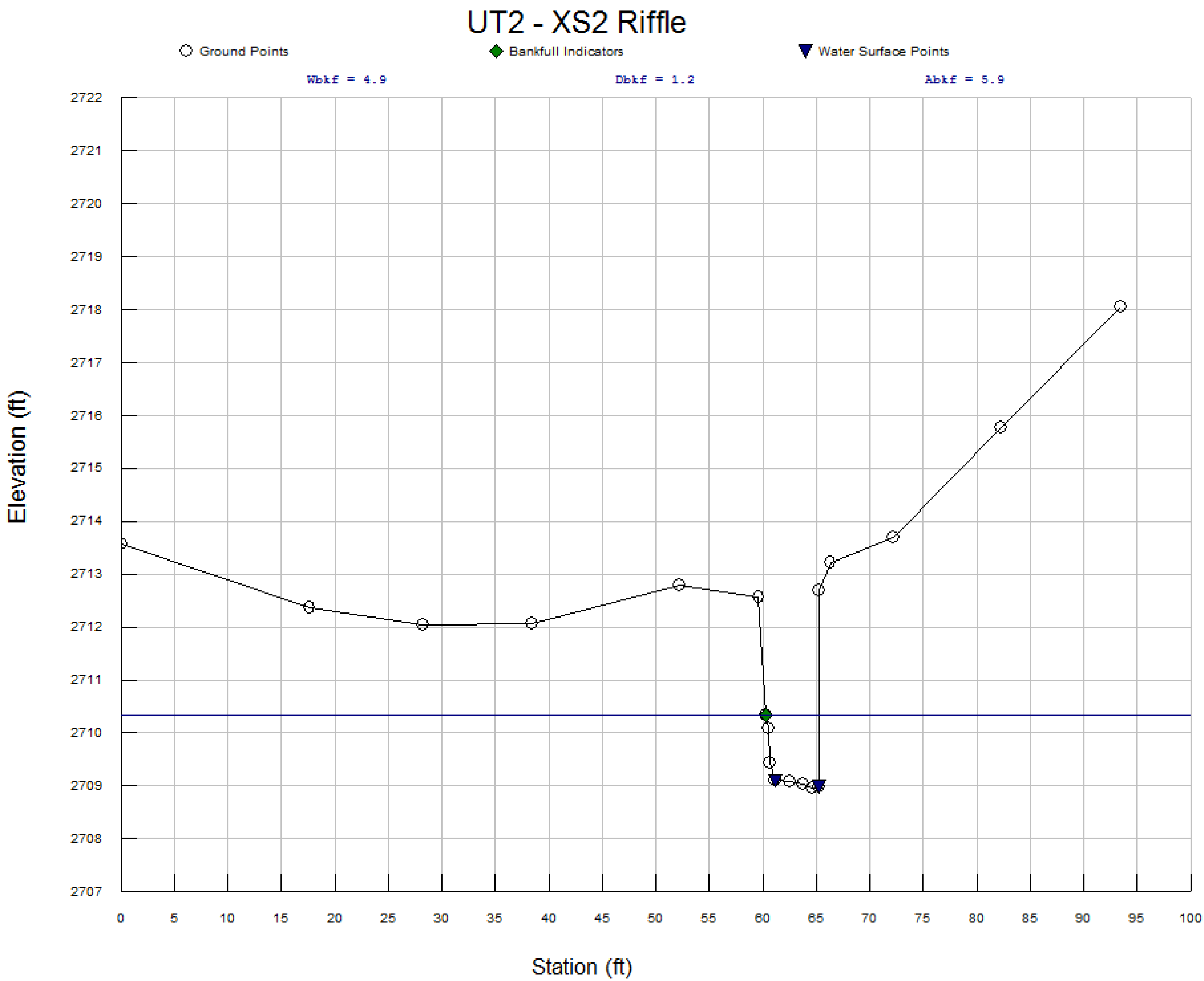
	Channel	Left	Right
Floodprone Elevation (ft)	2714.45	2714.45	2714.45
Bankfull Elevation (ft)	2712.14	2712.14	2712.14
Floodprone Width (ft)	55.65	-----	-----
Bankfull Width (ft)	8.13	4.06	4.06
Entrenchment Ratio	6.85	-----	-----
Mean Depth (ft)	1.72	1.68	1.77
Maximum Depth (ft)	2.31	2.31	2.3
Width/Depth Ratio	4.71	2.42	2.29
Bankfull Area (sq ft)	14.01	6.82	7.19
Wetted Perimeter (ft)	10.38	7.34	7.65
Hydraulic Radius (ft)	1.35	0.93	0.94
Begin BKF Station	43.25	43.25	47.31
End BKF Station	51.37	47.31	51.37

Entrainment Calculations

XS1 Pool Summary - UT2

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT2 - XS2 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 4.9
Dbkf = 1.2
Abkf = 5.9
Elevation (ft)
2722
2721
2720
2719
2718
2717
2716
2715
2714
2713
2712
2711
2710
2709
2708
2707
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Station (ft)

UT2 Reach 1 – XS2, looking downstream

UT2 Reach 2 – XS2, left bank

UT2 Reach 2 – XS2, right bank

XS2 Riffle Summary - UT2

RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Upper Reach 1
Cross Section Name: XS2 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2713.570821	riffle
17.64	0	2712.366246	
28.23	0	2712.045731	
38.41	0	2712.068457	
52.27	0	2712.783957	
59.61	0	2712.574703	
60.32	0	2710.343297	bkf
60.56	0	2710.080669	
60.63	0	2709.440351	
61.21	0	2709.097055	lew
62.52	0	2709.081658	
63.76	0	2709.028047	
64.64	0	2708.961272	
65.24	0	2708.979349	rew
65.3	0	2712.688324	
66.32	0	2713.216692	
72.18	0	2713.693173	
82.3	0	2715.779713	
93.47	0	2718.06213	

Cross Sectional Geometry

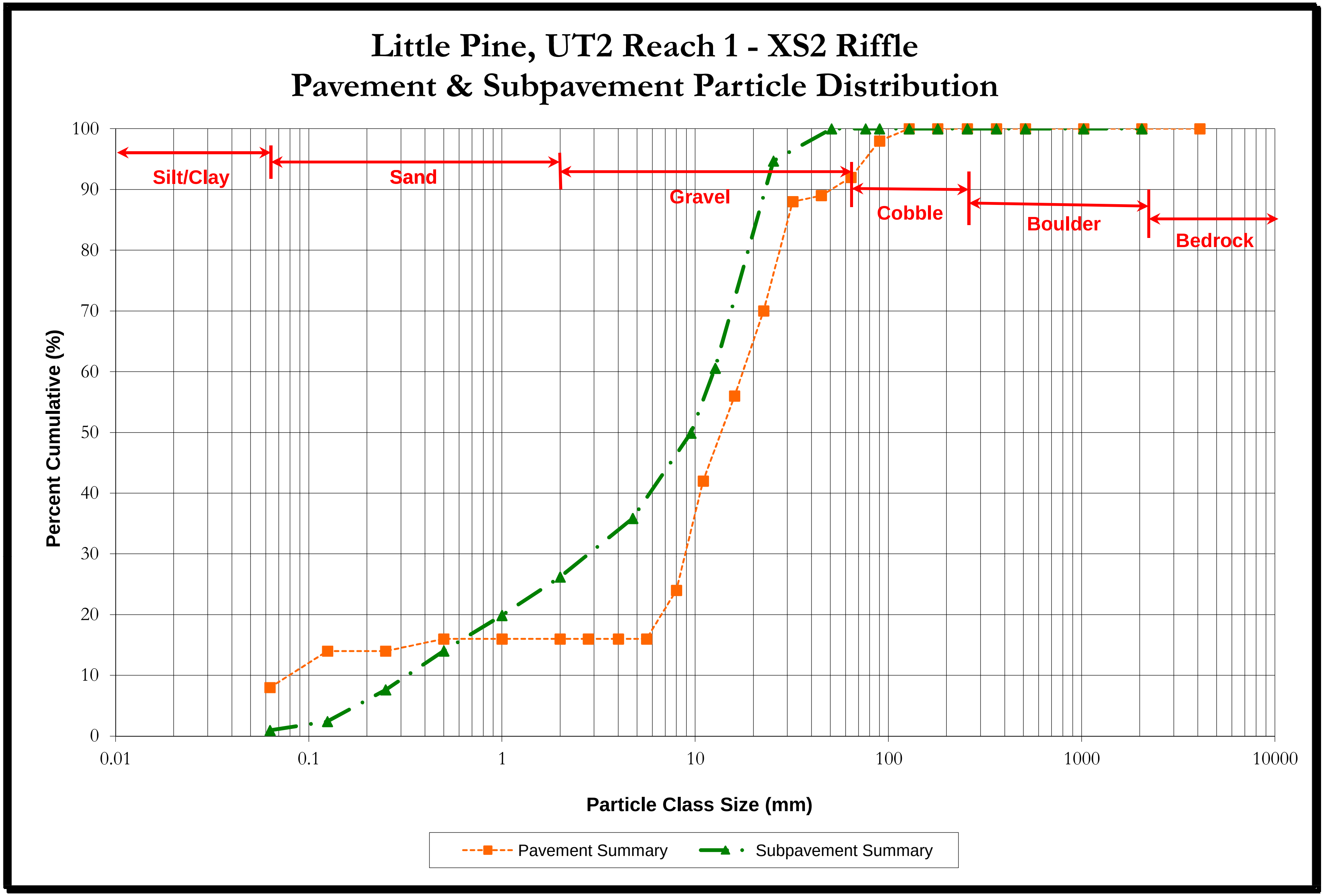
	Channel	Left	Right
Floodprone Elevation (ft)	2711.72	2711.72	2711.72
Bankfull Elevation (ft)	2710.34	2710.34	2710.34
Floodprone Width (ft)	5.4	-----	-----
Bankfull Width (ft)	4.94	2.47	2.47
Entrenchment Ratio	1.09	-----	-----
Mean Depth (ft)	1.2	1.08	1.33
Maximum Depth (ft)	1.38	1.27	1.38
Width/Depth Ratio	4.1	2.28	1.86
Bankfull Area (sq ft)	5.95	2.67	3.27
Wetted Perimeter (ft)	7.06	4.52	5.08
Hydraulic Radius (ft)	0.84	0.59	0.64
Begin BKF Station	60.32	60.32	62.79
End BKF Station	65.26	62.79	65.26

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

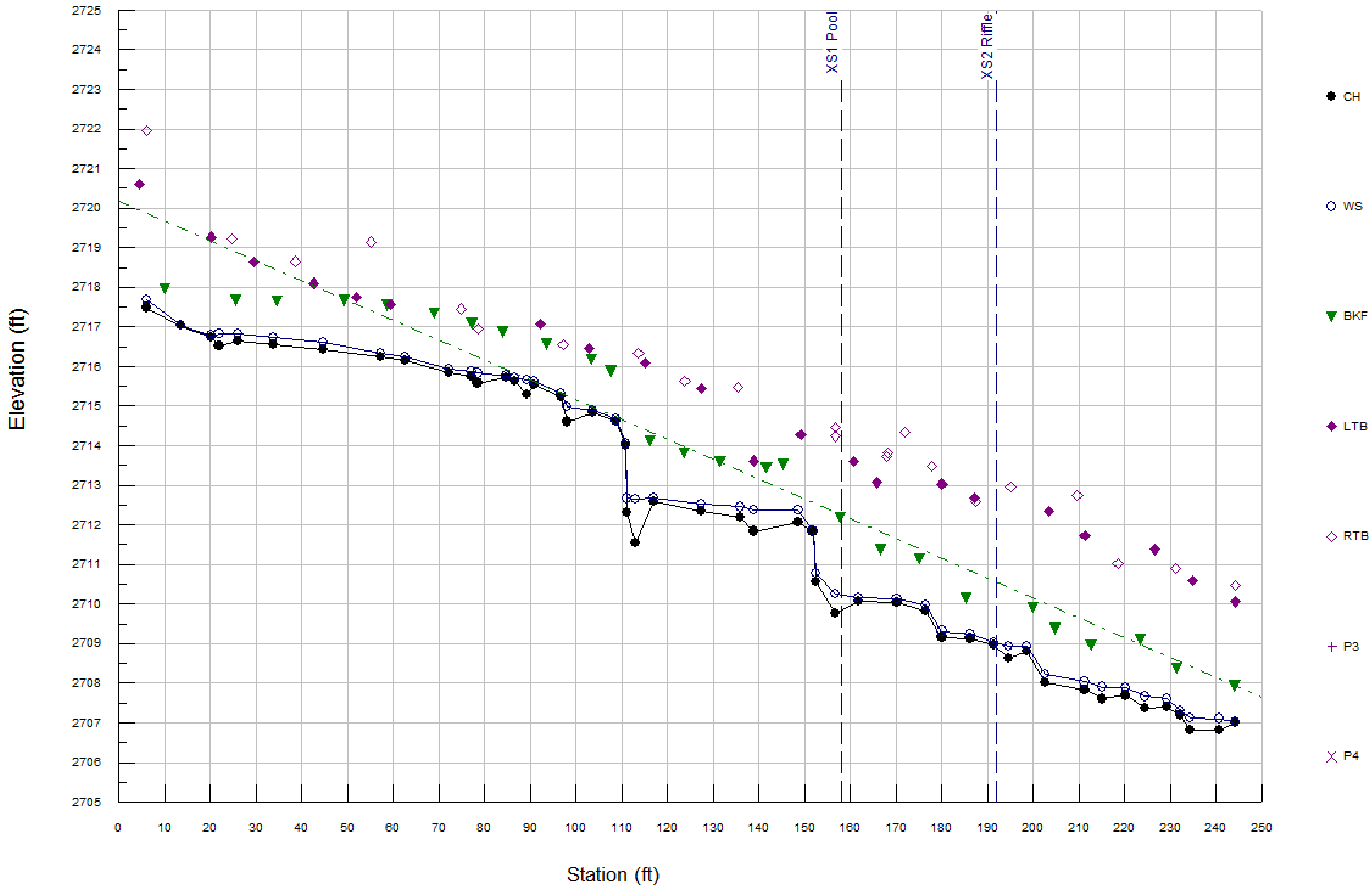
XS2 Riffle Summary - UT2

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine, UT2 Reach 1 - XS2 Riffle
Pavement & Subpavement Particle Distribution
Percent Cumulative (%)
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Pavement Summary
Subpavement Summary

UT2 - Upper Reach Profile 1



UT2 Upper Reach Profile 1
RIVERMORPH PROFILE SUMMARY

River Name: UT2
Reach Name: Upper Reach 1
Profile Name: Profile 1
Survey Date: 05/03/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
4.52				2720.604	
6	2717.485	2717.685			
6					2721.961
10.1			2717.953		
13.48	2717.029	2717.049			
20.15	2716.729	2716.779			
20.15				2719.265	
21.92	2716.515	2716.815			
24.7					2719.219
25.49			2717.669		
26.03	2716.636	2716.836			
29.49				2718.646	
33.75	2716.544	2716.744			
34.63			2717.645		
38.58					2718.649
42.65				2718.1	
44.7	2716.42	2716.62			
49.2			2717.671		
51.86				2717.758	
55.05					2719.144
57.33	2716.237	2716.337			
58.58			2717.547		
59.42				2717.575	
62.59	2716.144	2716.244			
68.99			2717.35		
72.1	2715.843	2715.943			
74.85					2717.456
77.13	2715.763	2715.863			
77.13			2717.082		
78.42	2715.579	2715.829			
78.49					2716.947
83.98			2716.868		
84.66	2715.719	2715.769			
86.62	2715.628	2715.728			
89.21	2715.283	2715.663			
90.78	2715.542	2715.642			
92.21				2717.074	
93.43			2716.56		
96.69	2715.224	2715.324			
97.12					2716.549
98.09	2714.602	2714.992			
102.89				2716.47	
103.28			2716.187		
103.63	2714.831	2714.881			
107.52			2715.888		
108.76	2714.616	2714.666			
110.8	2713.999	2714.049			

111.08	2712.317	2712.667			
113.06	2711.556	2712.656			
113.6					2716.335
115.08				2716.101	
116.21			2714.125		
117.05	2712.585	2712.685			
123.61			2713.825		
123.73					2715.621
127.3				2715.455	
127.43	2712.336	2712.536			
131.49			2713.603		
135.3					2715.469
135.81	2712.201	2712.451			
138.74	2711.83	2712.38			
138.74				2713.613	
141.6			2713.445		
145.15			2713.526		
148.5	2712.079	2712.379			
149.11				2714.282	
151.81	2711.813	2711.863			
152.36	2710.569	2710.769			
156.64	2709.752	2710.252			
156.64					2714.235
156.64					2714.471
157.73			2712.191		
160.67				2713.61	
161.85	2710.075	2710.175			
165.78				2713.069	
166.57			2711.381		
167.99					2713.715
168.11					2713.822
170.14	2710.035	2710.135			
171.88					2714.348
175.06			2711.137		
176.34	2709.829	2709.979			
177.83					2713.478
180.01	2709.165	2709.315			
180.01				2713.034	
185.31			2710.147		
186.17	2709.136	2709.236			
187.02				2712.682	
187.3					2712.589
191.3	2708.969	2709.019			
194.56	2708.634	2708.934			
194.99					2712.955
198.57	2708.817	2708.917			
199.81			2709.91		
202.66	2708.008	2708.228			
203.38				2712.337	
204.77			2709.377		
209.61					2712.749
211.24	2707.83	2708.03			
211.24				2711.727	
212.55			2708.968		
215.09	2707.603	2707.903			
218.48					2711.025
220.07	2707.692	2707.892			
223.31			2709.097		
224.34	2707.36	2707.66			
226.63				2711.377	
229.15	2707.403	2707.603			
231.17					2710.909
231.3			2708.384		

232.21	2707.197	2707.297			
234.22	2706.826	2707.126			
234.87				2710.602	
240.75	2706.822	2707.102			
244.01			2707.936		
244.17	2706.999	2707.019		2710.058	2710.46

Cross Section Locations

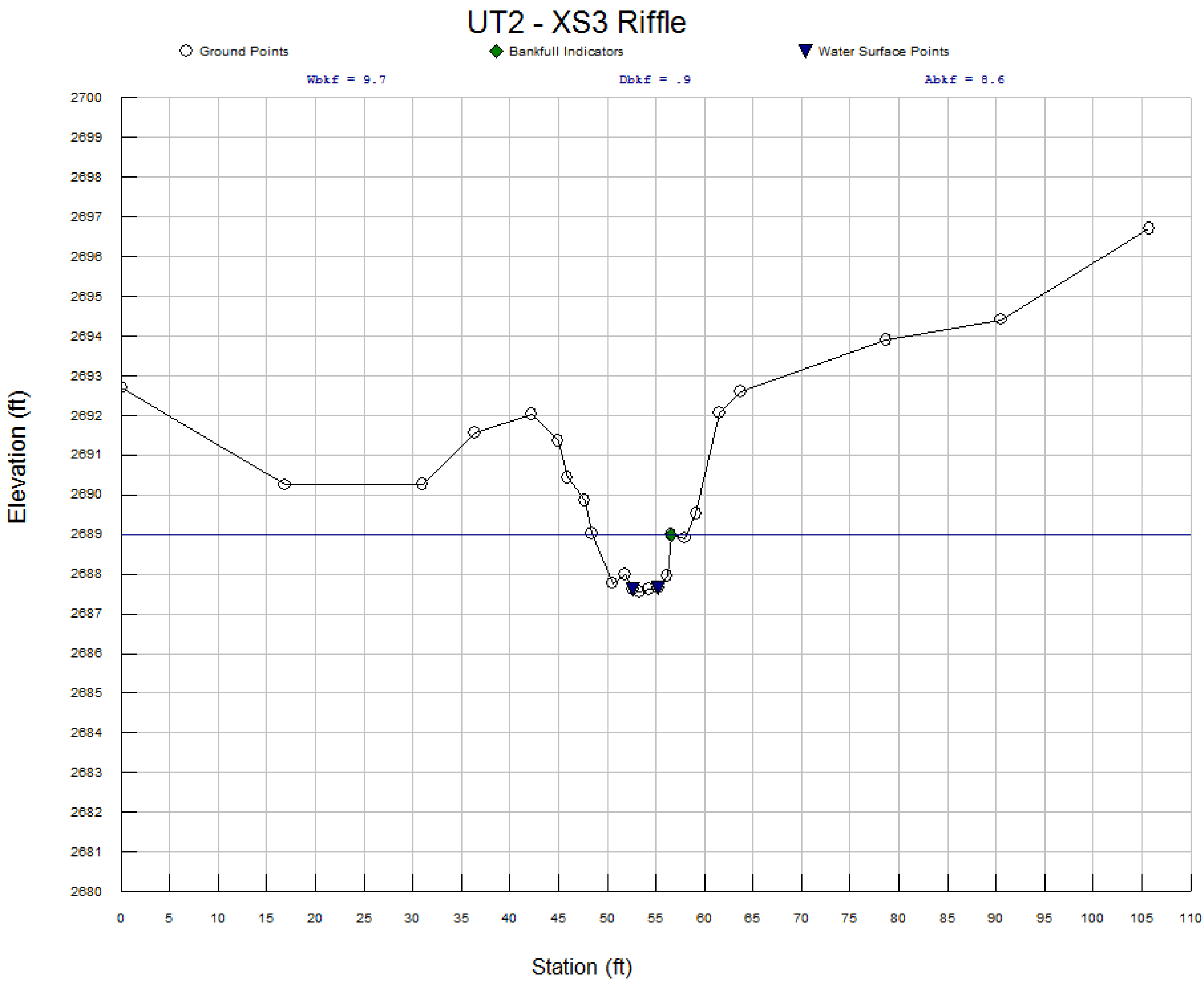
Cross Section Name	Type	Profile Station
XS1 Pool	Pool	158.46
XS2 Riffle	Riffle	192.04

Measurements from Graph

Bankfull Slope: 0.05026

Variable	Min	Avg	Max
S riffle	0.01205	0.05186	0.08226
S pool	0	0.00969	0.02215
S run	0	0.03298	0.06142
S glide	0	0.01249	0.01919
P - P	9.28	26.73	56.76
P length	5.52	7.51	11.93
Dmax riffle	0.81	1.15	1.42
Dmax pool	1.37	1.84	2.65
Dmax run	1.12	1.28	1.5
Dmax glide	1.14	1.39	1.76
Low Bank Ht	1.27	2.37	3.56

Length and depth measurements in feet, slopes in ft/ft.



UT2 - XS3 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 9.7
Dbkf = .9
Abkf = 8.6
Elevation (ft)
Station (ft)
2700
2699
2698
2697
2696
2695
2694
2693
2692
2691
2690
2689
2688
2687
2686
2685
2684
2683
2682
2681
2680
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110

UT2 Reach 1 – XS3, looking downstream

UT2 Reach 1 – XS3, left bank

UT2 Reach 1 – XS3, right bank

XS3 Riffle Summary - UT2

RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Upper Reach 2
Cross Section Name: XS3 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2692.69443	riffle
16.89	0	2690.246568	
31.01	0	2690.26569	
36.36	0	2691.55264	
42.22	0	2692.04528	
44.94	0	2691.349268	
45.89	0	2690.430653	
47.68	0	2689.846622	
48.37	0	2689.013926	
50.55	0	2687.772167	
51.85	0	2687.99168	
52.63	0	2687.623362	lew
53.33	0	2687.564521	
54.28	0	2687.622568	
55.29	0	2687.669256	rew
56.14	0	2687.95371	
56.55	0	2688.990406	bkf
57.97	0	2688.908533	
59.15	0	2689.530113	
61.5	0	2692.0787	
63.72	0	2692.598486	
78.69	0	2693.888429	
90.47	0	2694.417096	
105.74	0	2696.703073	

Cross Sectional Geometry

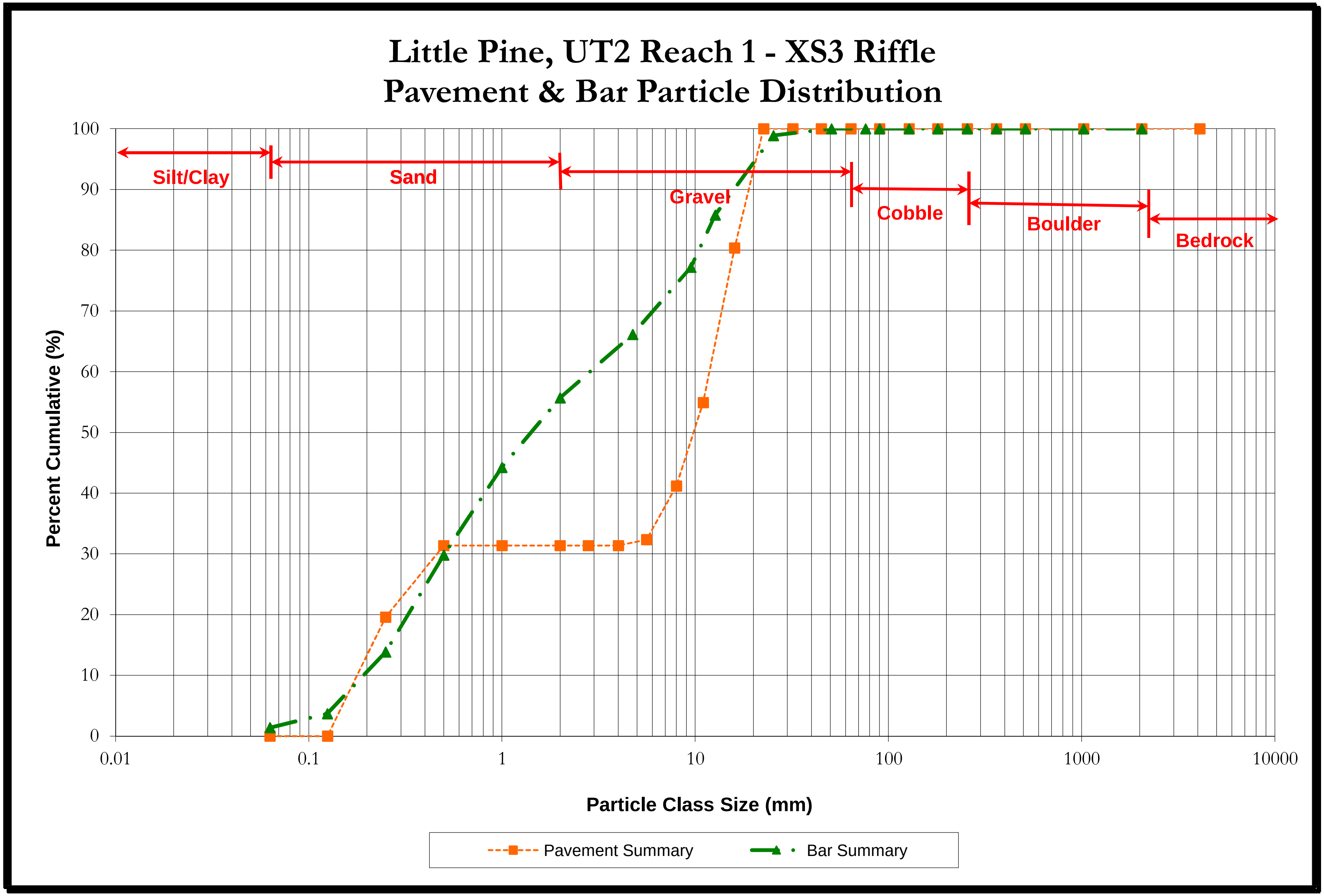
	Channel	Left	Right
Floodprone Elevation (ft)	2690.42	2690.42	2690.42
Bankfull Elevation (ft)	2688.99	2688.99	2688.99
Floodprone Width (ft)	29.94	-----	-----
Bankfull Width (ft)	9.71	4.85	4.86
Entrenchment Ratio	3.08	-----	-----
Mean Depth (ft)	0.89	0.94	0.84
Maximum Depth (ft)	1.43	1.42	1.43
Width/Depth Ratio	10.95	5.17	5.8
Bankfull Area (sq ft)	8.6	4.54	4.06
Wetted Perimeter (ft)	10.91	6.69	7.05
Hydraulic Radius (ft)	0.79	0.68	0.58
Begin BKF Station	48.41	48.41	53.26
End BKF Station	58.12	53.26	58.12

XS3 Riffle Summary - UT2

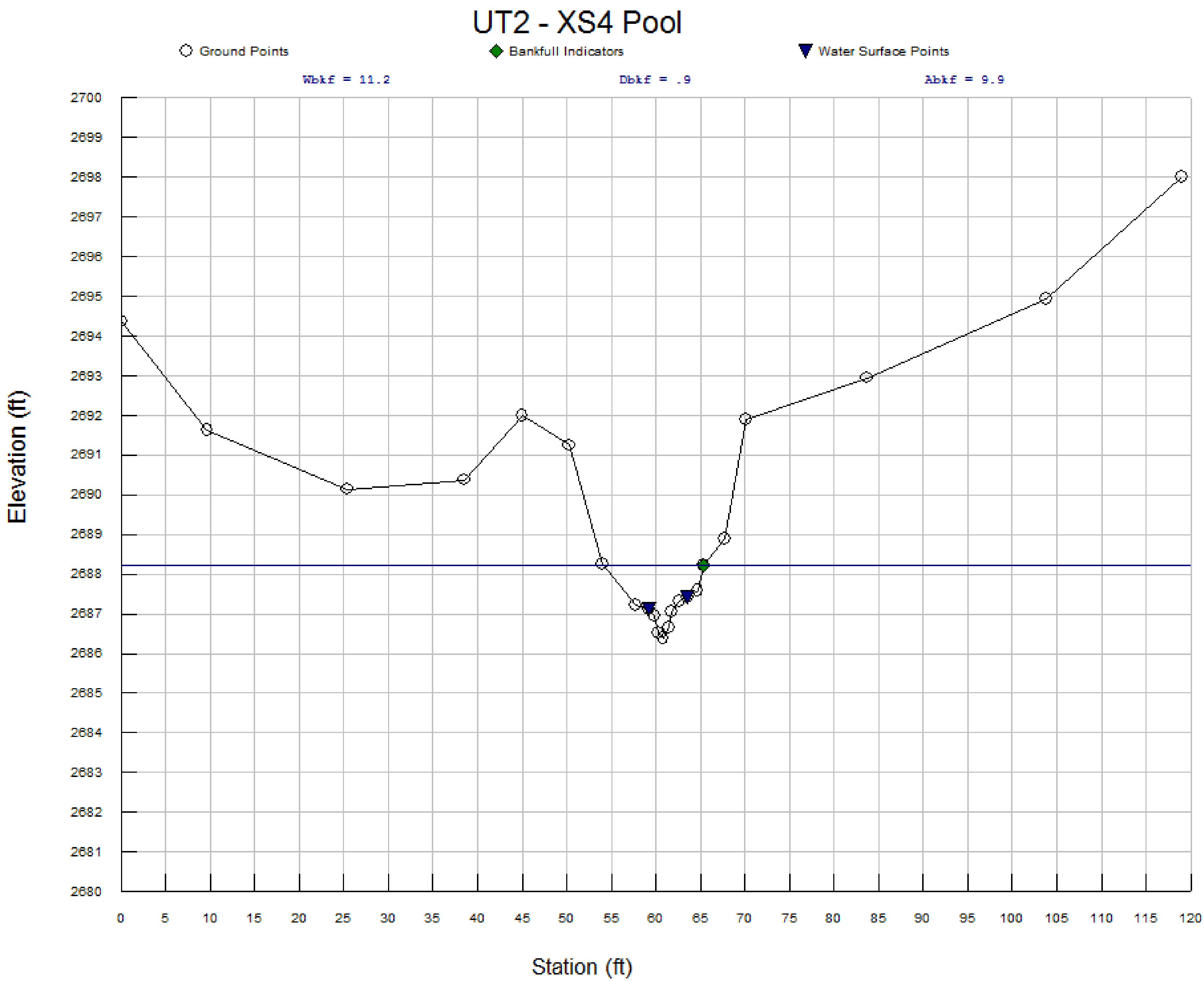
Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine, UT2 Reach 1 - XS3 Riffle
Pavement & Bar Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Pavement Summary
Bar Summary



UT2 - XS4 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 11.2
Dbkf = .9
Abkf = 9.9
Elevation (ft)
2700
2699
2698
2697
2696
2695
2694
2693
2692
2691
2690
2689
2688
2687
2686
2685
2684
2683
2682
2681
2680
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110
115
120
Station (ft)

UT2 Reach 1 – XS4, looking downstream

UT2 Reach 1 – XS4, left bank

UT2 Reach 1 – XS4, right bank

XS4 Pool Summary - UT2
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Upper Reach 2
Cross Section Name: XS4 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2694.378781	pool
9.67	0	2691.639698	
25.39	0	2690.140681	
38.46	0	2690.37413	
45	0	2692.001003	
50.24	0	2691.246429	
53.95	0	2688.261948	
57.7	0	2687.222555	
59.27	0	2687.129436	lew
59.79	0	2686.943434	
60.29	0	2686.512804	
60.81	0	2686.396368	
61.51	0	2686.649602	
61.82	0	2687.053385	
62.68	0	2687.312465	
63.51	0	2687.436305	rew
64.69	0	2687.594871	
65.33	0	2688.223133	bkf
67.78	0	2688.878883	
70.08	0	2691.894288	
83.71	0	2692.946853	
103.85	0	2694.944309	
119.01	0	2698.001016	

Cross Sectional Geometry

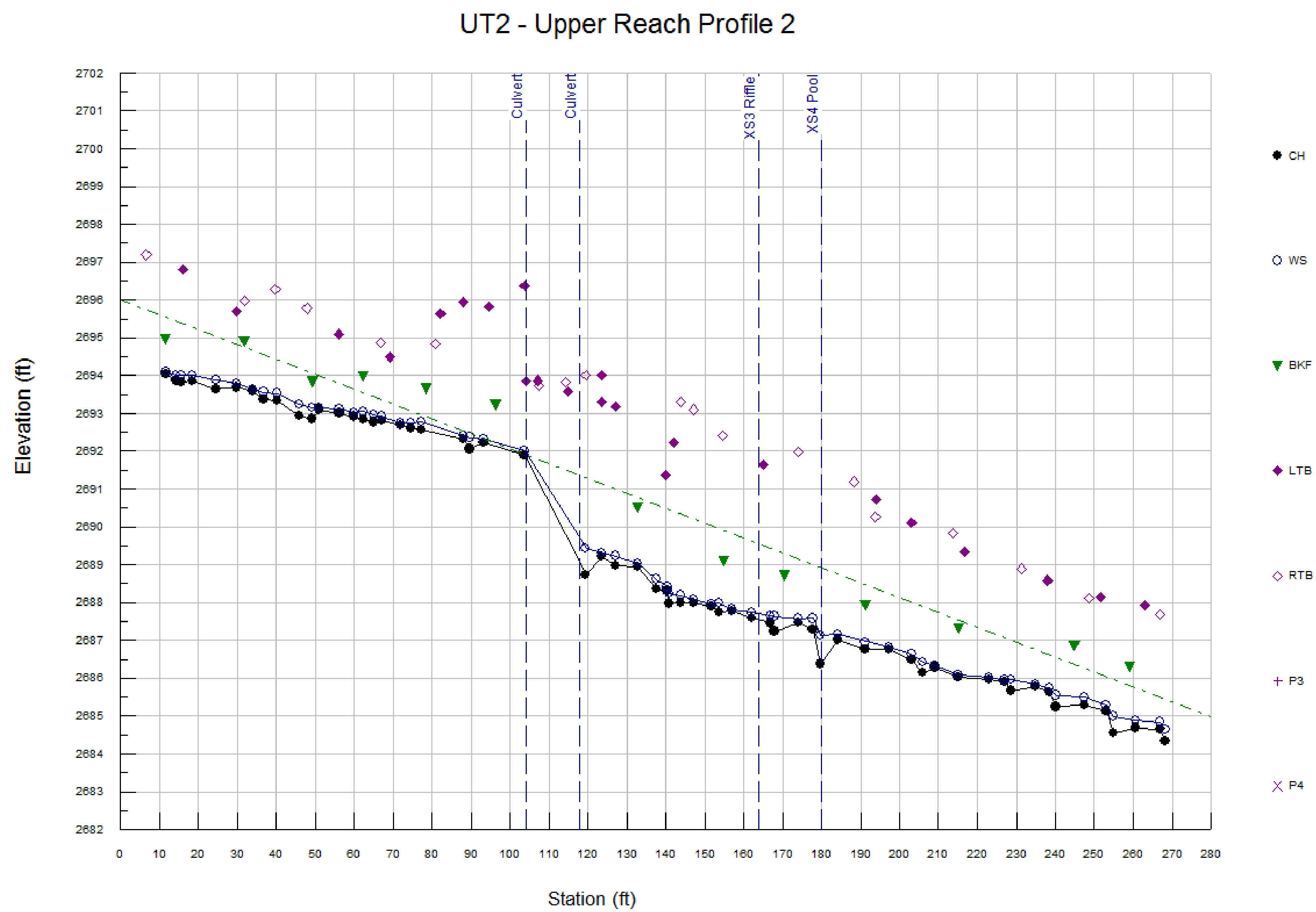
	Channel	Left	Right
Floodprone Elevation (ft)	2690.04	2690.04	2690.04
Bankfull Elevation (ft)	2688.22	2688.22	2688.22
Floodprone Width (ft)	16.93	-----	-----
Bankfull Width (ft)	11.23	5.61	5.62
Entrenchment Ratio	1.51	-----	-----
Mean Depth (ft)	0.89	0.7	1.07
Maximum Depth (ft)	1.82	1.25	1.82
Width/Depth Ratio	12.67	7.97	5.26
Bankfull Area (sq ft)	9.95	3.95	6
Wetted Perimeter (ft)	12.13	7.02	7.6
Hydraulic Radius (ft)	0.82	0.56	0.79
Begin BKF Station	54.1	54.1	59.71
End BKF Station	65.33	59.71	65.33

Entrainment Calculations

XS4 Pool Summary - UT2

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



UT2 - Upper Reach Profile 2
Elevation (ft)
Station (ft)
2702
2701
2700
2699
2698
2697
2696
2695
2694
2693
2692
2691
2690
2689
2688
2687
2686
2685
2684
2683
2682
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260
270
280
Culvert
Culvert
XS3 Riffle
XS4 Pool
CH
WS
BKF
LTB
RTB
P3
P4

UT2 Upper Reach Profile 2 Summary
RIVERMORPH PROFILE SUMMARY

River Name: UT2
Reach Name: Upper Reach 2
Profile Name: Profile 2
Survey Date: 05/04/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
6.55					2697.193
11.54			2694.969		
11.62	2694.034	2694.104			
14.1	2693.874	2694.024			
15.59	2693.818	2694.018			
16.07				2696.809	
18.46	2693.862	2694.012			
24.5	2693.639	2693.889			
29.66	2693.691	2693.791			
29.66				2695.691	
31.73			2694.897		
31.85					2695.977
33.98	2693.599	2693.649			
36.77	2693.36	2693.56			
39.75					2696.28
40.24	2693.332	2693.532			
45.95	2692.946	2693.246			
47.82					2695.781
49.09	2692.859	2693.159			
49.31			2693.843		
51	2693.102	2693.152			
55.97				2695.102	
56.18	2693.01	2693.11			
59.91	2692.916	2693.016			
62.24			2693.984		
62.41	2692.847	2693.047			
64.9	2692.769	2692.969			
66.7					2694.862
67.04	2692.818	2692.918			
69.12				2694.492	
71.92	2692.688	2692.738			
74.48	2692.614	2692.764			
77.18	2692.57	2692.77			
78.42			2693.663		
80.84					2694.846
82.16				2695.632	
88.03	2692.313	2692.413			
88.03				2695.939	
89.63	2692.066	2692.366			
93.27	2692.22	2692.32			
94.54				2695.821	
96.26			2693.23		
103.7	2691.899	2691.999			
103.7				2696.372	
104.13				2693.85	
107.22				2693.87	
107.31					2693.747

114.29					2693.836
114.92				2693.574	
119.47	2688.741	2689.441			
119.47					2694
123.51	2689.219	2689.319			
123.51				2693.294	
123.51				2694.008	
127.16	2688.981	2689.231			
127.16				2693.185	
132.85	2688.938	2689.038			
132.85			2690.511		
137.55	2688.37	2688.62			
140.05				2691.381	
140.41	2688.311	2688.411			
140.96	2687.979	2688.229			
142.09				2692.23	
143.82	2687.987	2688.187			
143.82					2693.314
147.14					2693.103
147.19	2687.989	2688.089			
151.71	2687.909	2687.959			
153.63	2687.748	2687.998			
154.58					2692.412
154.92			2689.108		
157.06	2687.774	2687.824			
162.04	2687.587	2687.737			
165.05				2691.654	
166.87	2687.457	2687.657			
167.9	2687.239	2687.639			
170.54			2688.716		
174.09	2687.471	2687.571			
174.09					2691.982
177.75	2687.279	2687.579			
179.68	2686.377	2687.127			
184.2	2687.021	2687.171			
188.35					2691.198
191.19	2686.761	2686.961			
191.19			2687.922		
193.84					2690.275
194.05				2690.715	
197.36	2686.772	2686.822			
203.07	2686.494	2686.644			
203.07				2690.113	
205.89	2686.137	2686.437			
209.11	2686.284	2686.334			
213.83					2689.838
215.08	2686.023	2686.093			
215.16			2687.319		
216.75				2689.334	
222.92	2685.967	2686.017			
227	2685.896	2685.946			
228.62	2685.67	2685.97			
231.28					2688.894
235	2685.78	2685.83			
238.04				2688.59	
238.61	2685.634	2685.734			
240.17	2685.246	2685.546			
244.89			2686.853		
247.58	2685.291	2685.491			
248.68					2688.123
251.65				2688.15	
253.04	2685.143	2685.293			
254.86	2684.546	2684.996			

259.21			2686.296		
260.74	2684.687	2684.887			
262.95				2687.928	
266.8	2684.642	2684.842			
266.99					2687.684
268.29	2684.349	2684.649			

Cross Section Locations

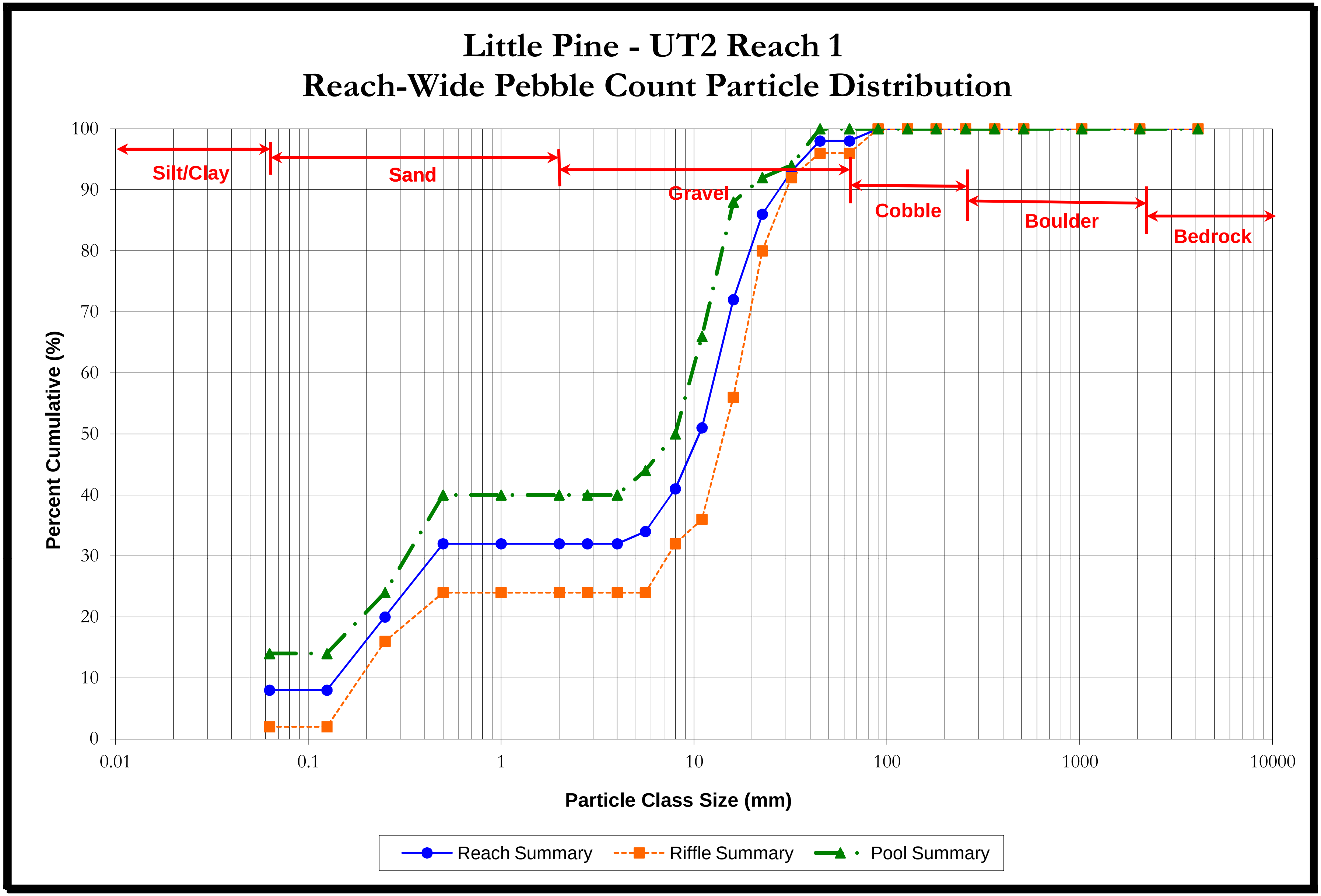
Cross Section Name	Type	Profile Station
Culvert	Riffle	104.34
Culvert	Riffle	117.57
XS3 Riffle	Riffle	163.97
XS4 Pool	Pool	179.86

Measurements from Graph

Bankfull Slope: 0.02949

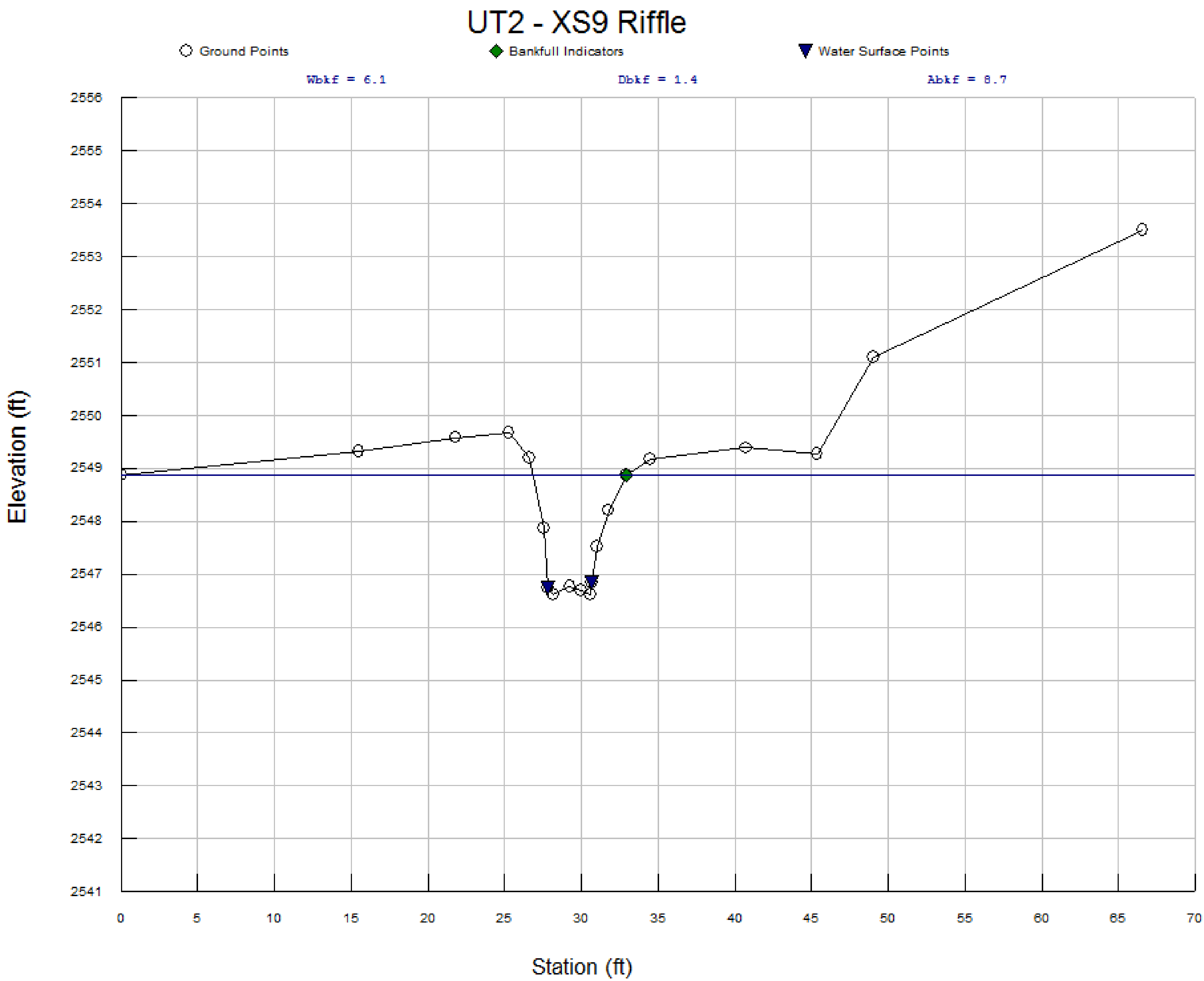
Variable	Min	Avg	Max
S riffle	0.01428	0.03035	0.08292
S pool	0.00321	0.01492	0.03024
S run	0.01469	0.0536	0.09254
S glide	0	0.00905	0.01958
P - P	11.13	22.82	40.82
P length	3.96	6.24	9.65
Dmax riffle	1.07	1.31	1.68
Dmax pool	1.14	1.61	2.14
Dmax run	0.97	1.36	2.06
Dmax glide	0.94	1.33	1.6
Low Bank Ht	1.98	2.79	4.1

Length and depth measurements in feet, slopes in ft/ft.



Little Pine - UT2 Reach 1
Reach-Wide Pebble Count Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
Particle Class Size (mm)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Reach Summary
Riffle Summary
Pool Summary

UT2 – Reach 2



UT2 - XS9 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.1
Dbkf = 1.4
Abkf = 8.7
Elevation (ft)
2556
2555
2554
2553
2552
2551
2550
2549
2548
2547
2546
2545
2544
2543
2542
2541
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
Station (ft)

UT2 Reach 2 – XS9, looking downstream


UT2 Reach 2 – XS9, left bank


UT2 Reach 2 – XS9, right bank

XS9 Riffle Summary - UT2

RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Middle Reach
Cross Section Name: XS9 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2548.875336	riffle
15.49	0	2549.323047	
21.81	0	2549.583933	
25.28	0	2549.673606	
26.63	0	2549.20106	
27.54	0	2547.862052	
27.87	0	2546.75063	lew
28.17	0	2546.616645	
29.26	0	2546.765274	
29.99	0	2546.698617	
30.63	0	2546.615479	
30.71	0	2546.829727	rew
31.06	0	2547.523729	
31.77	0	2548.204643	
32.93	0	2548.87432	bkf
34.48	0	2549.16648	
40.76	0	2549.3865	
45.37	0	2549.272856	
49.08	0	2551.095841	
66.59	0	2553.498703	

Cross Sectional Geometry

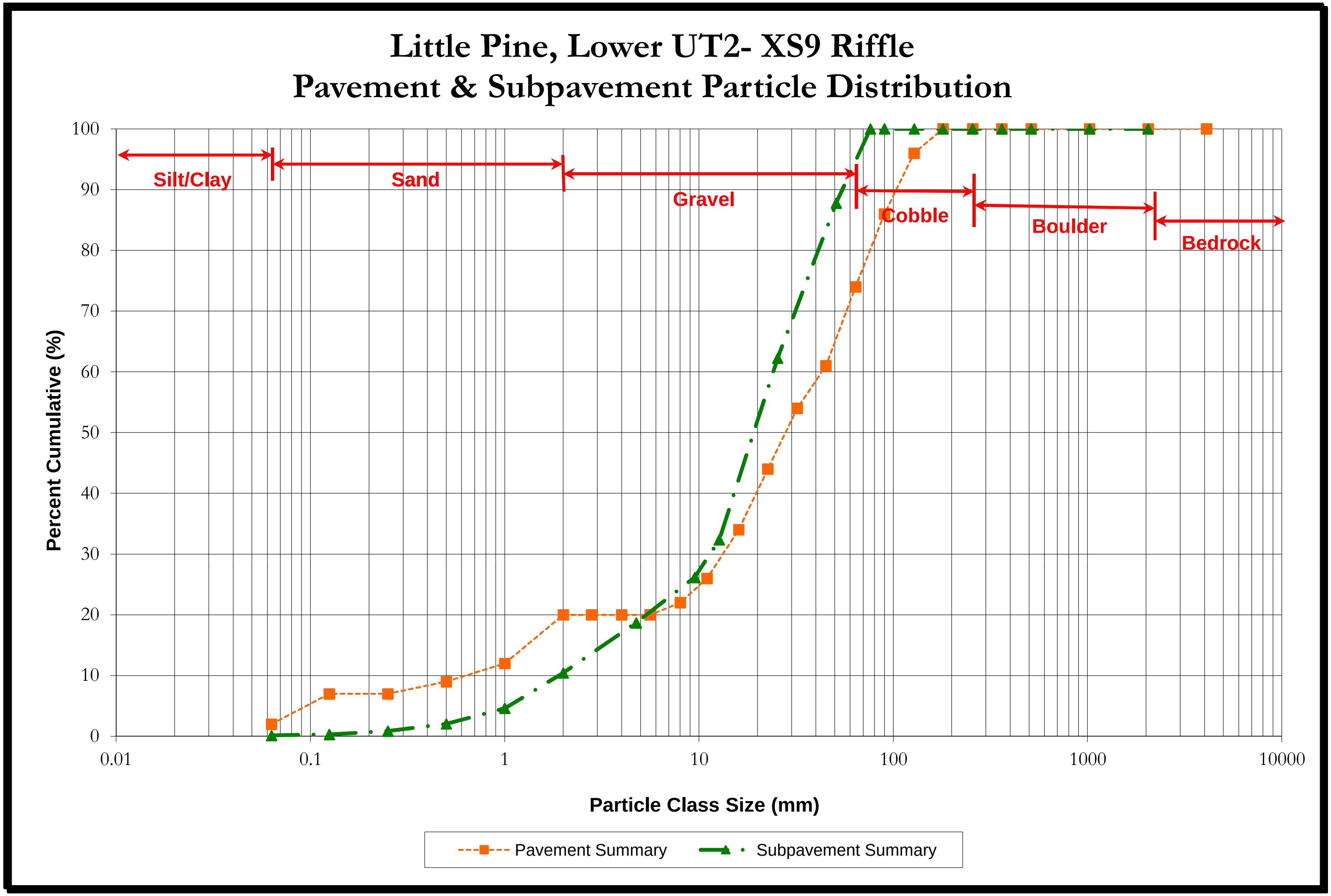
	Channel	Left	Right
Floodprone Elevation (ft)	2551.12	2551.12	2551.12
Bankfull Elevation (ft)	2548.87	2548.87	2548.87
Floodprone Width (ft)	49.29	-----	-----
Bankfull Width (ft)	6.07	3.04	3.03
Entrenchment Ratio	8.12	-----	-----
Mean Depth (ft)	1.44	1.73	1.15
Maximum Depth (ft)	2.25	2.25	2.25
Width/Depth Ratio	4.22	1.76	2.63
Bankfull Area (sq ft)	8.73	5.24	3.49
Wetted Perimeter (ft)	8.51	6.6	6.23
Hydraulic Radius (ft)	1.03	0.79	0.56
Begin BKF Station	26.85	26.85	29.89
End BKF Station	32.92	29.89	32.92

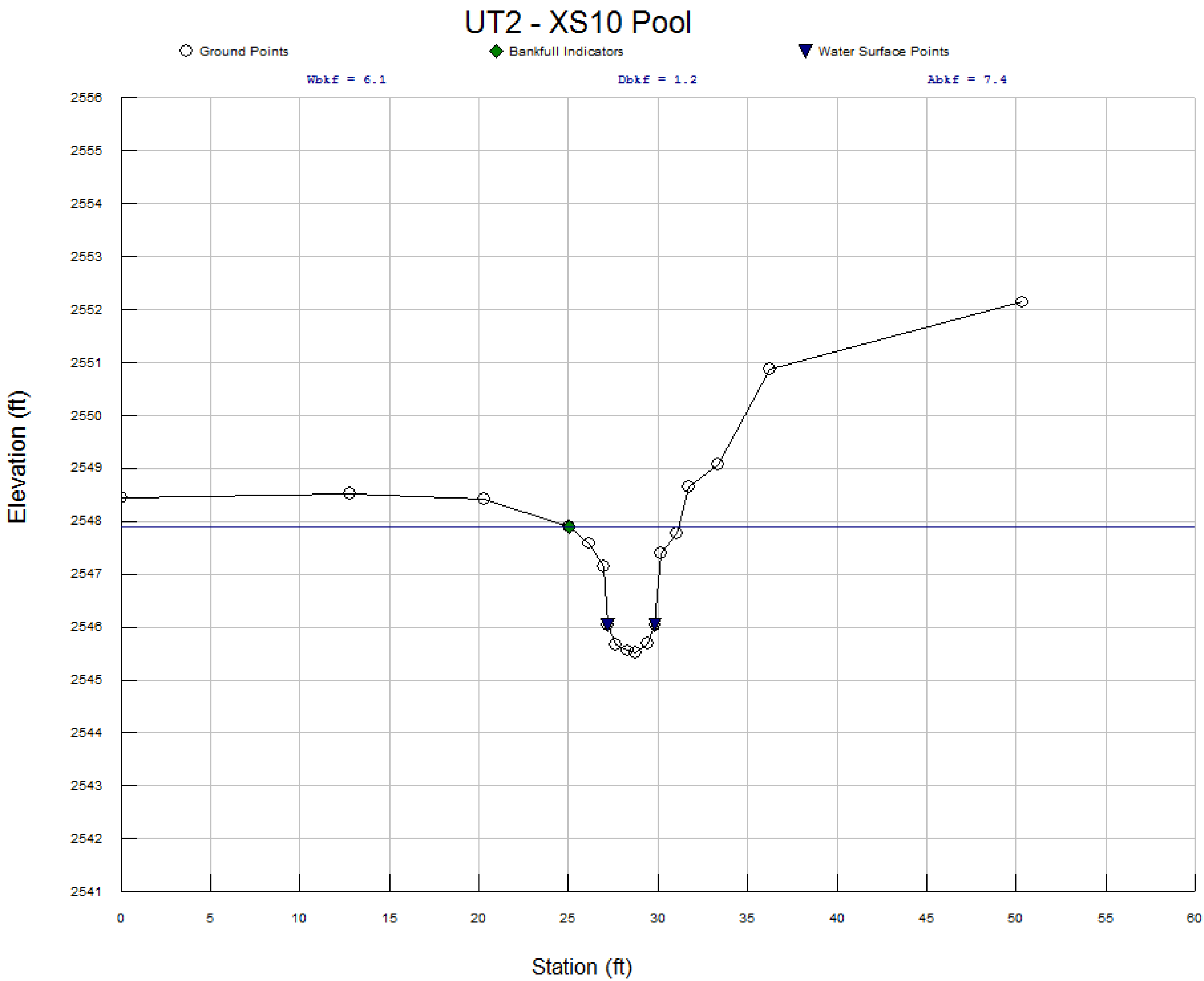
Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

XS9 Riffle Summary - UT2

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Little Pine, Lower UT2- XS9 Riffle
Pavement & Subpavement Particle Distribution
Percent Cumulative (%)
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Pavement Summary
Subpavement Summary


UT2 - XS10 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.1
Dbkf = 1.2
Abkf = 7.4
Elevation (ft)
Station (ft)
2541
2542
2543
2544
2545
2546
2547
2548
2549
2550
2551
2552
2553
2554
2555
2556
0
5
10
15
20
25
30
35
40
45
50
55
60

UT2 Reach 2 – XS10, looking downstream

UT2 Reach 2 – XS10, left bank

UT2 Reach 2 – XS10, right bank

XS10 Pool Summary - UT2
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Middle Reach
Cross Section Name: XS10 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2548.441305	pool
12.79	0	2548.519461	
20.29	0	2548.412471	
25.04	0	2547.898393	bkf
26.14	0	2547.582234	-
26.98	0	2547.148443	
27.21	0	2546.041919	lew
27.63	0	2545.664612	
28.3	0	2545.551671	
28.77	0	2545.526141	
29.42	0	2545.694242	
29.82	0	2546.039814	rew
30.13	0	2547.392344	
31.04	0	2547.775139	
31.74	0	2548.644743	
33.37	0	2549.068728	
36.26	0	2550.876544	
50.38	0	2552.141056	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2550.27	2550.27	2550.27
Bankfull Elevation (ft)	2547.9	2547.9	2547.9
Floodprone Width (ft)	35.3	-----	-----
Bankfull Width (ft)	6.12	3.33	2.78
Entrenchment Ratio	5.77	-----	-----
Mean Depth (ft)	1.21	1.04	1.41
Maximum Depth (ft)	2.37	2.35	2.37
Width/Depth Ratio	5.06	3.21	1.97
Bankfull Area (sq ft)	7.39	3.46	3.93
Wetted Perimeter (ft)	8.68	6.89	6.5
Hydraulic Radius (ft)	0.85	0.5	0.61
Begin BKF Station	25.03	25.03	28.36
End BKF Station	31.14	28.36	31.14

Entrainment Calculations

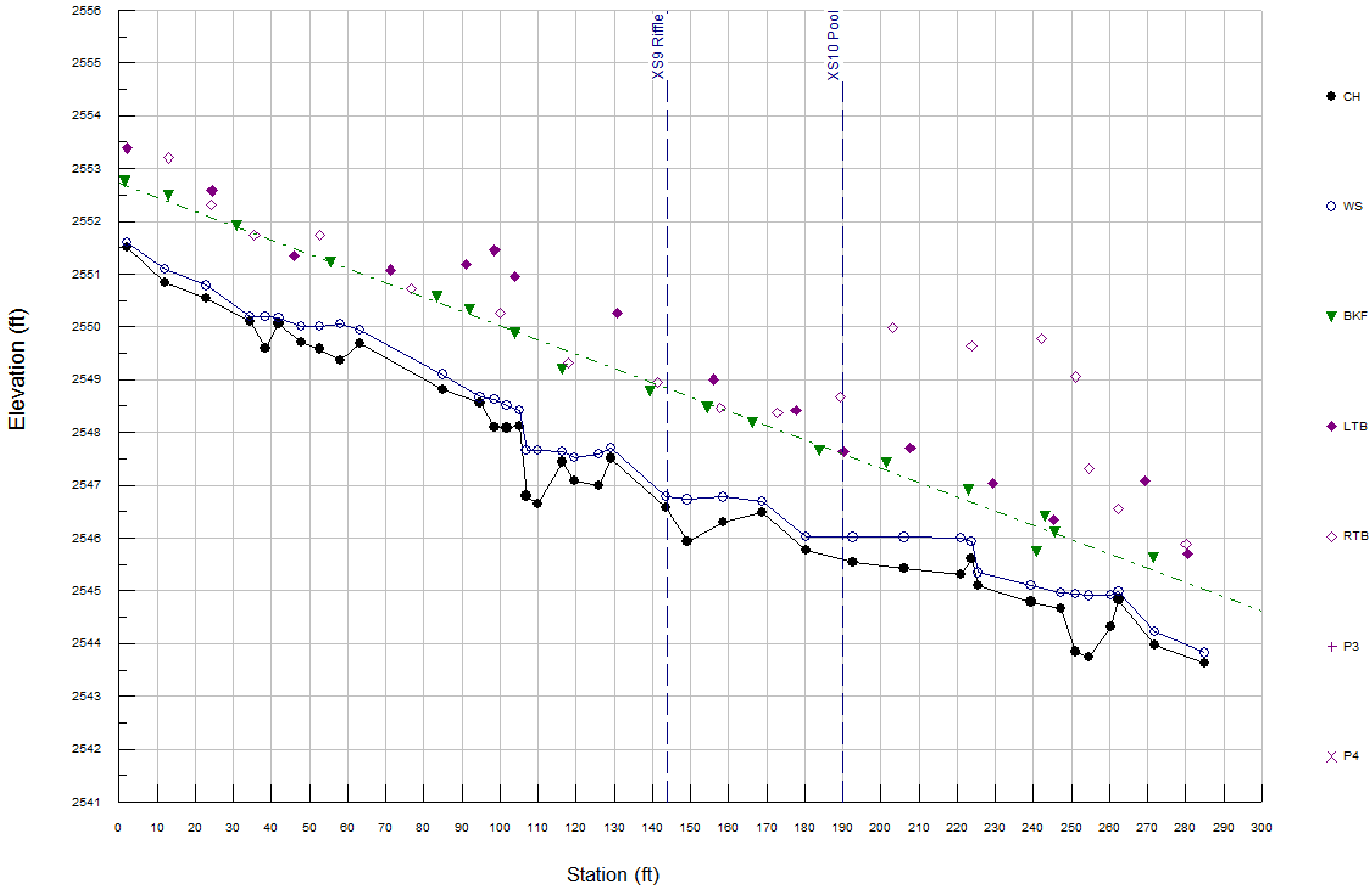
Entrainment Formula: Rosgen Modified Shields Curve

Channel Left Side Right Side

XS10 Pool Summary - UT2

Slope
Shear Stress (lb/sq ft)
Movable Particle (mm)

UT2 - Middle Reach Profile



middle profile
RIVERMORPH PROFILE SUMMARY

River Name: UT2
Reach Name: Middle Reach
Profile Name: Profile 1
Survey Date: 05/04/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
1.48			2552.763		
2				2553.382	
2.21	2551.5	2551.6			
12	2550.835	2551.085			
12.98			2552.502		
13.05					2553.2
22.84	2550.533	2550.783			
24.18					2552.315
24.39				2552.577	
30.88			2551.915		
34.44	2550.093	2550.193			
35.49					2551.731
38.47	2549.601	2550.191			
41.93	2550.062	2550.162			
46.03				2551.338	
47.92	2549.708	2550.008			
52.63	2549.582	2550.012			
52.63					2551.732
55.48			2551.229		
58.01	2549.356	2550.056			
63.29	2549.682	2549.932			
71.23				2551.079	
76.62					2550.723
83.39			2550.572		
84.92	2548.819	2549.099			
90.94				2551.189	
92.06			2550.336		
94.75	2548.562	2548.662			
98.59	2548.098	2548.628			
98.59				2551.451	
100.07					2550.259
101.77	2548.086	2548.506			
103.82				2550.961	
103.93			2549.879		
105.26	2548.116	2548.416			
106.91	2546.795	2547.655			
109.86	2546.644	2547.664			
116.33	2547.44	2547.64			
116.33			2549.212		
118.06					2549.315
119.55	2547.081	2547.521			
125.85	2546.995	2547.595			
129.13	2547.507	2547.707			
130.84				2550.259	
139.45			2548.786		
141.34					2548.944
143.63	2546.579	2546.779			

149.22	2545.931	2546.731			
154.28			2548.474		
155.98				2549.006	
157.81					2548.463
158.53	2546.294	2546.774			
166.29			2548.185		
168.77	2546.487	2546.687			
172.77					2548.38
177.68				2548.415	
180.29	2545.774	2546.024			
183.92			2547.65		
189.2					2548.668
190.15				2547.629	
192.68	2545.546	2546.016			
201.41			2547.427		
203.14					2549.987
206.1	2545.417	2546.017			
207.7				2547.702	
220.95	2545.31	2546			
222.94			2546.911		
223.75	2545.615	2545.935			
223.75					2549.636
225.52	2545.096	2545.346			
229.38				2547.028	
239.35	2544.79	2545.11			
240.79			2545.746		
242.21					2549.781
243.05			2546.42		
245.22				2546.343	
245.64			2546.119		
247.19	2544.658	2544.958			
251.01	2543.843	2544.943			
251.01					2549.053
254.58	2543.74	2544.91			
254.58					2547.319
260.32	2544.323	2544.923			
262.22					2546.546
262.43	2544.835	2544.985			
269.35				2547.084	
271.56			2545.637		
271.8	2543.971	2544.221			
280.05					2545.88
280.59				2545.705	
285.06	2543.628	2543.828			

Cross Section Locations

Cross Section Name	Type	Profile Station
XS9 Riffle	Riffle	143.63
XS10 Pool	Pool	189.59

Measurements from Graph

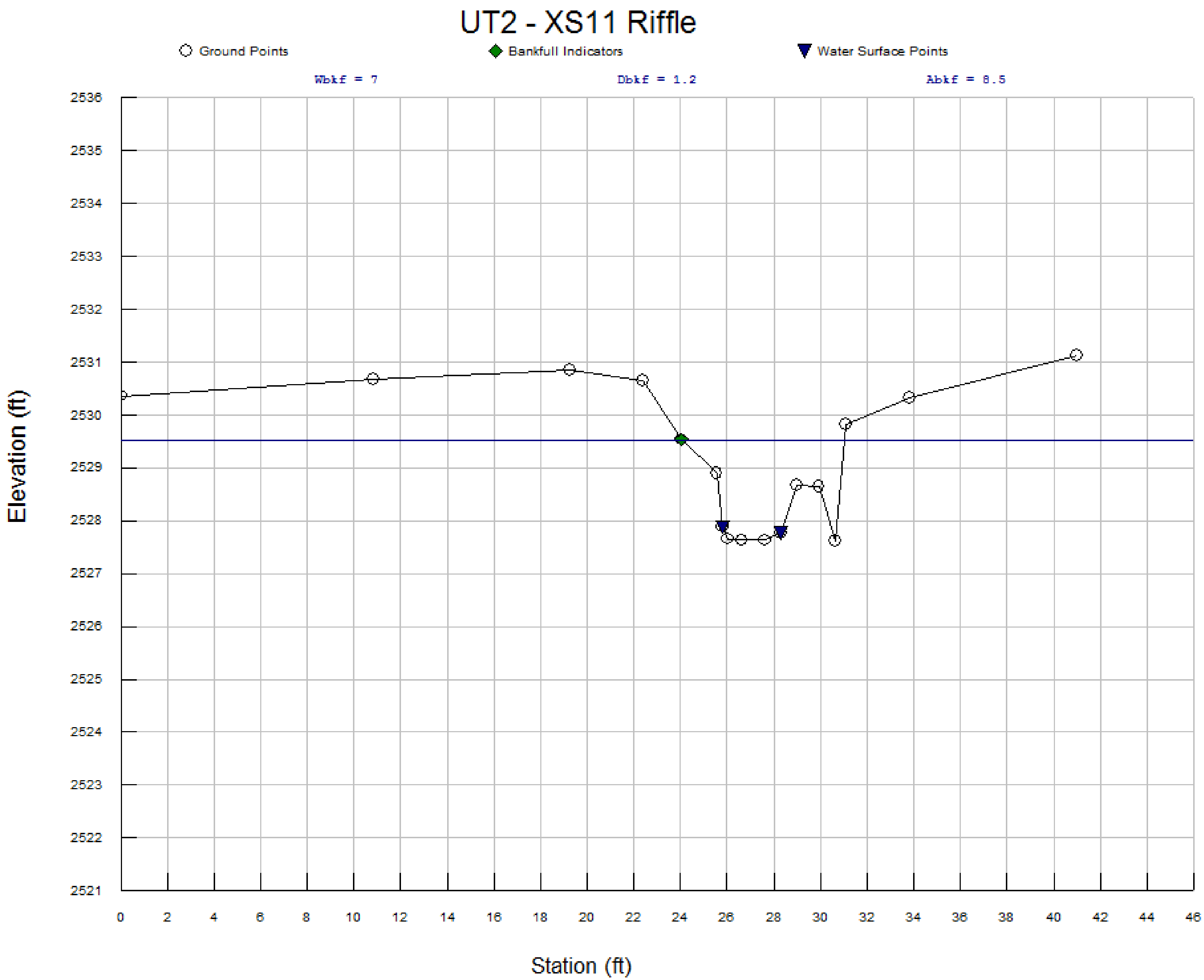
Bankfull Slope: 0.027

Variable	Min	Avg	Max
S riffle	0.03272	0.04606	0.06281
S pool	0	0.00622	0.02339
S run	0.0022	0.01237	0.01963
S glide	0.00197	0.01682	0.03149

		middle profile	
P - P	14.05	36.49	68.12
P length	6.63	18.55	41.08
Dmax riffle	0.92	1.4	1.72
Dmax pool	1.58	2.27	3.17
Dmax run	1.51	1.94	2.61
Dmax glide	1.45	1.77	2.16
Low Bank Ht	1.51	1.84	2.4

Length and depth measurements in feet, slopes in ft/ft.

UT2 – Reach 3



UT2 - XS11 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 7
Dbkf = 1.2
Abkf = 8.5
Elevation (ft)
Station (ft)
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
2521
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46

UT2 Reach 3 – XS11, looking downstream

	
UT2 Reach 3 – XS11, left bank	UT2 Reach 3 – XS11, right bank

XS11 Riffle Summary - UT2
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Lower Reach
Cross Section Name: XS11 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2530.359417	riffle
10.83	0	2530.675029	
19.25	0	2530.849465	
22.4	0	2530.652956	
24.04	0	2529.534128	bkf
25.54	0	2528.891449	
25.79	0	2527.882532	lew
26.01	0	2527.653425	
26.63	0	2527.630243	
27.62	0	2527.632934	
28.29	0	2527.767608	rew
28.98	0	2528.669801	
29.93	0	2528.647678	
30.63	0	2527.61763	
31.11	0	2529.822273	
33.82	0	2530.315783	
41	0	2531.12295	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2531.44	2531.44	2531.44
Bankfull Elevation (ft)	2529.53	2529.53	2529.53
Floodprone Width (ft)	41	-----	-----
Bankfull Width (ft)	7	3.5	3.5
Entrenchment Ratio	5.86	-----	-----
Mean Depth (ft)	1.22	1.16	1.28
Maximum Depth (ft)	1.91	1.9	1.91
Width/Depth Ratio	5.74	3.01	2.74
Bankfull Area (sq ft)	8.53	4.07	4.47
Wetted Perimeter (ft)	10.56	6.42	7.94
Hydraulic Radius (ft)	0.81	0.63	0.56
Begin BKF Station	24.05	24.05	27.55
End BKF Station	31.05	27.55	31.05

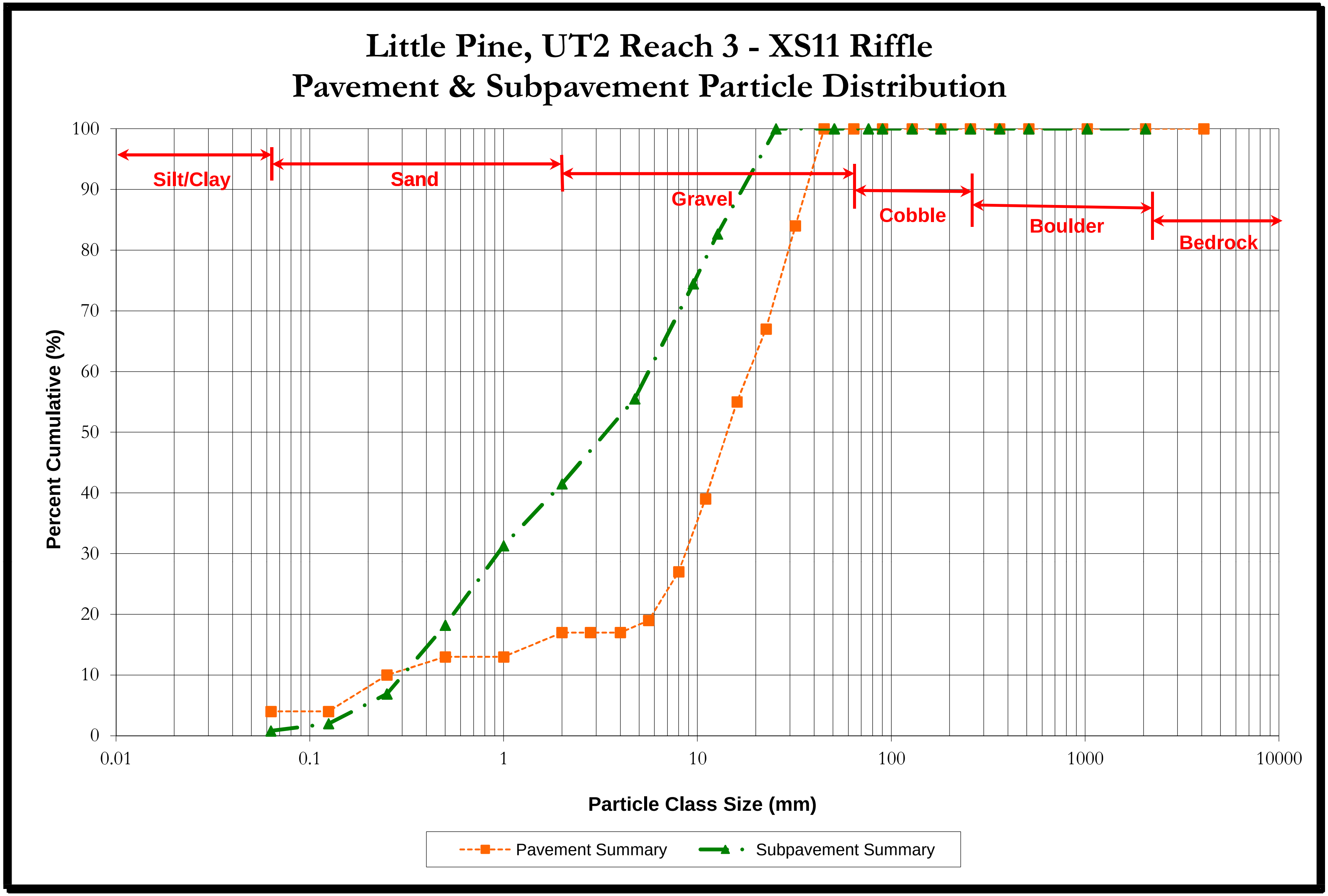
Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

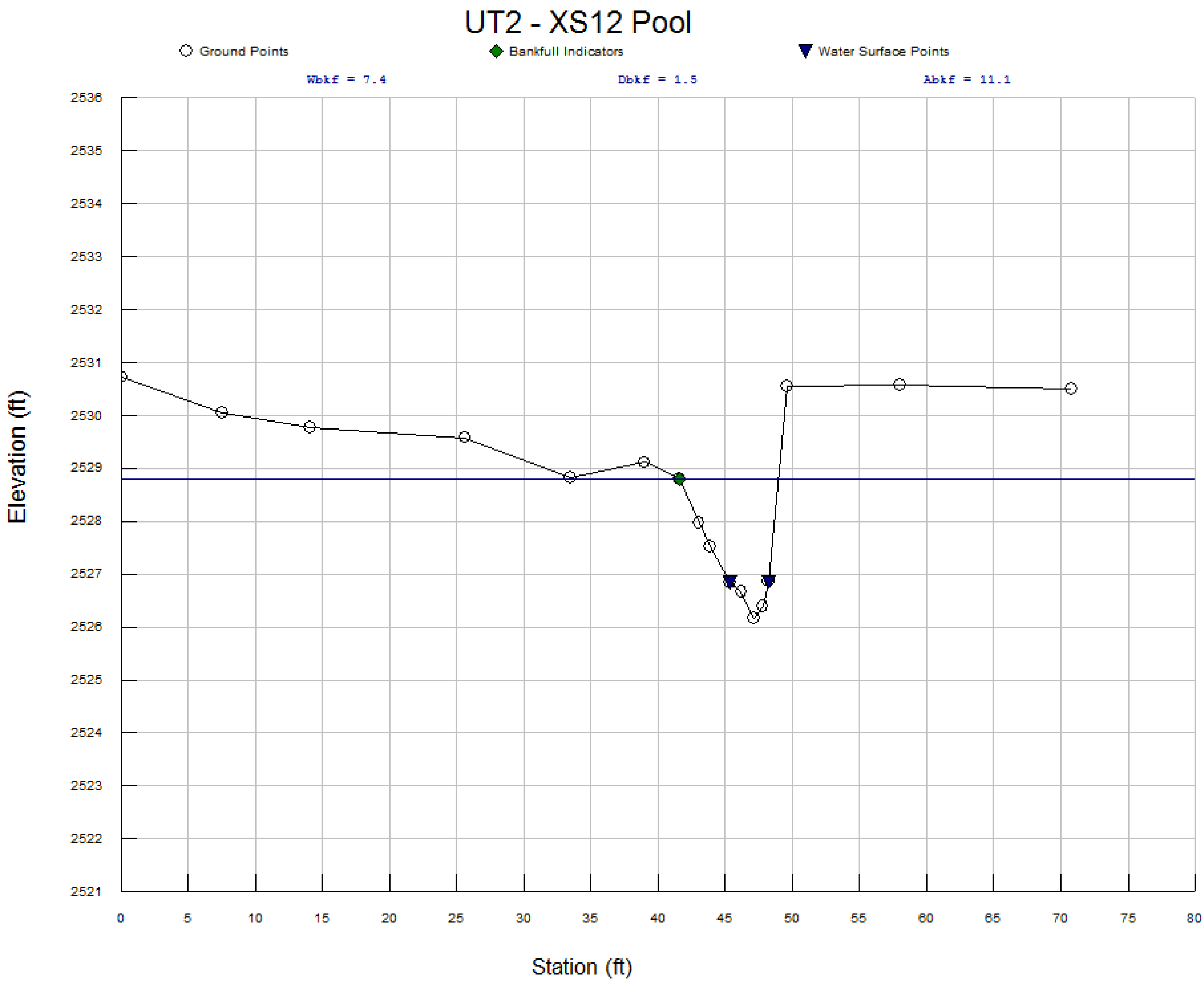
	Channel	Left Side	Right Side
Slope			

XS11 Riffle Summary - UT2

Shear Stress (lb/sq ft)
Movable Particle (mm)



Little Pine, UT2 Reach 3 - XS11 Riffle
Pavement & Subpavement Particle Distribution
Percent Cumulative (%)
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Pavement Summary
Subpavement Summary



UT2 - XS12 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 7.4
Dbkf = 1.5
Abkf = 11.1
Elevation (ft)
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
2521
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
Station (ft)

UT2 Reach 3 – XS12, looking downstream


UT2 Reach 3 – XS12, left bank


UT2 Reach 3 – XS12, right bank

XS12 Pool Summary - UT2
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Lower Reach
Cross Section Name: XS12 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2530.714536	pool
7.57	0	2530.054669	
14.09	0	2529.784352	
25.62	0	2529.585154	
33.46	0	2528.810359	
38.99	0	2529.107707	
41.57	0	2528.790972	bkf
43.04	0	2527.969699	-
43.91	0	2527.515205	
45.39	0	2526.835206	lew
46.2	0	2526.669857	
47.14	0	2526.15883	
47.79	0	2526.385341	
48.24	0	2526.852809	rew
49.59	0	2530.538518	
58.03	0	2530.573988	
70.77	0	2530.504297	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	2531.42	2531.42	2531.42
Bankfull Elevation (ft)	2528.79	2528.79	2528.79
Floodprone Width (ft)	70.77	-----	-----
Bankfull Width (ft)	7.38	4.27	3.11
Entrenchment Ratio	9.59	-----	-----
Mean Depth (ft)	1.5	1.13	2.02
Maximum Depth (ft)	2.63	2.05	2.63
Width/Depth Ratio	4.91	3.79	1.54
Bankfull Area (sq ft)	11.09	4.8	6.28
Wetted Perimeter (ft)	9.59	6.8	6.88
Hydraulic Radius (ft)	1.16	0.71	0.91
Begin BKF Station	41.57	41.57	45.84
End BKF Station	48.95	45.84	48.95

Entrainment Calculations

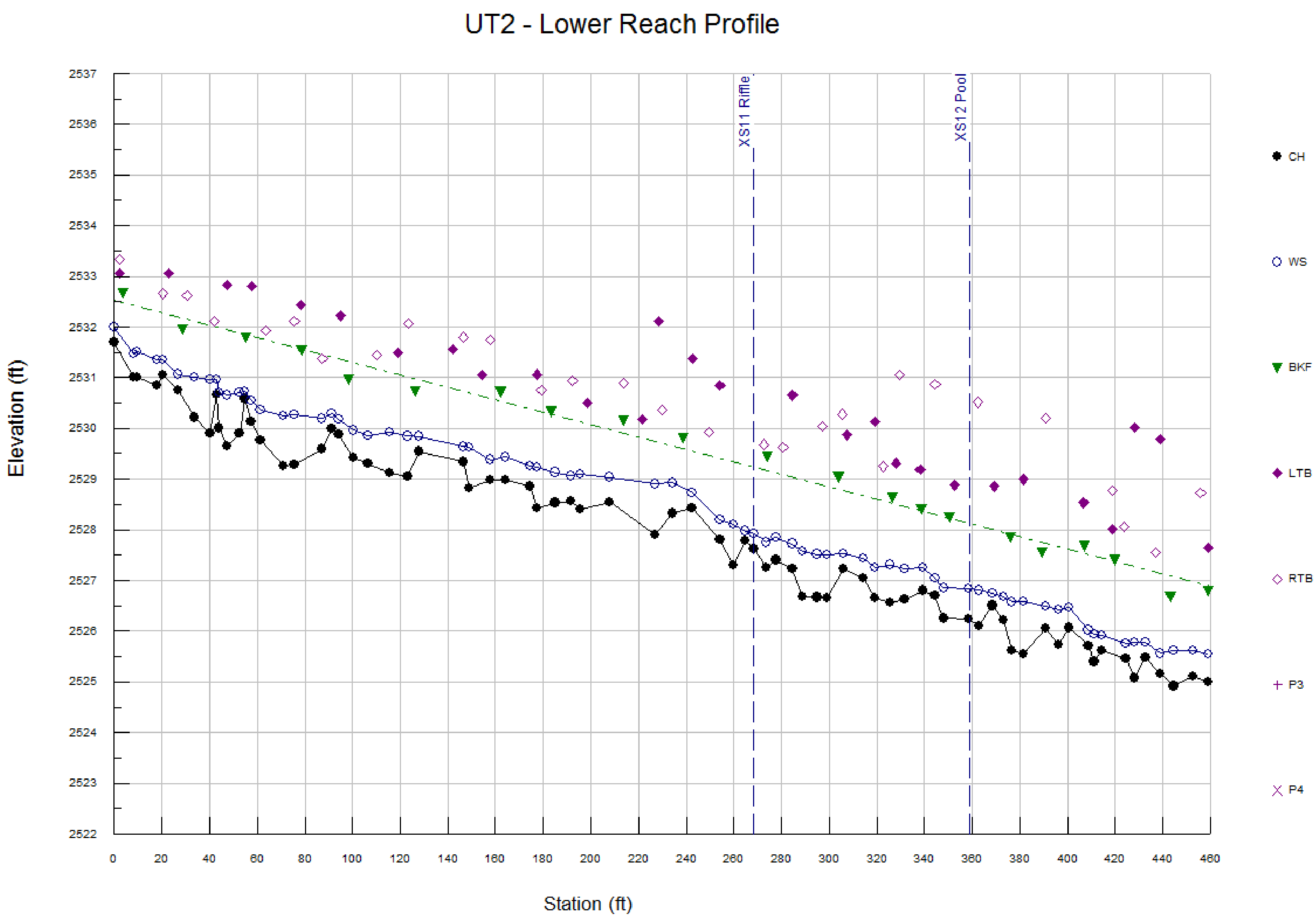
Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			

XS12 Pool Summary - UT2

Shear Stress (lb/sq ft)

Movable Particle (mm)


UT2 - Lower Reach Profile
Elevation (ft)
Station (ft)
2537
2536
2535
2534
2533
2532
2531
2530
2529
2528
2527
2526
2525
2524
2523
2522
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
XS11 Riffle
XS12 Pool
CH
WS
BKF
LTB
RTB
P3
P4

UT2 Lower Reach Profile Summary
RIVERMORPH PROFILE SUMMARY

River Name: UT2
Reach Name: Lower Reach
Profile Name: Profile 1
Survey Date: 05/03/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
0	2531.704	2532.004			
2.22					2533.337
2.36				2533.059	
3.67			2532.662		
8.31	2531.012	2531.462			
9.79	2531.015	2531.515			
18.14	2530.853	2531.353			
20.29	2531.051	2531.351			
20.34					2532.658
23.02				2533.062	
26.89	2530.764	2531.064			
28.76			2531.954		
30.52					2532.618
33.61	2530.216	2531.016			
40.29	2529.912	2530.962			
42.16					2532.123
42.89	2530.664	2530.964			
44.05	2530.008	2530.708			
47.49	2529.653	2530.653			
47.49				2532.83	
52.57	2529.912	2530.712			
54.58	2530.581	2530.731			
55.34			2531.791		
57.53	2530.141	2530.541			
57.73				2532.813	
61.37	2529.762	2530.362			
63.61					2531.934
70.97	2529.255	2530.255			
75.56	2529.272	2530.272			
75.56					2532.122
78.17				2532.434	
78.57			2531.544		
86.96	2529.591	2530.191			
87.37					2531.379
91.32	2529.996	2530.296			
94.21	2529.873	2530.173			
95.15				2532.219	
98.29			2530.968		
100.38	2529.412	2529.962			
106.43	2529.31	2529.86			
110.15					2531.445
115.67	2529.122	2529.922			
119.05				2531.486	
123.2	2529.05	2529.85			
123.42					2532.066
126.31			2530.733		
127.67	2529.543	2529.843			

142.02				2531.563	
146.39	2529.338	2529.638			
146.39					2531.804
149	2528.821	2529.621			
154.5				2531.048	
157.88	2528.983	2529.383			
157.88					2531.749
162			2530.72		
164.09	2528.981	2529.431			
174.67	2528.855	2529.255			
177.26				2531.062	
177.32	2528.435	2529.235			
179.14					2530.751
183.19			2530.329		
185.08	2528.532	2529.132			
191.76	2528.567	2529.067			
192.32					2530.935
195.67	2528.406	2529.106			
198.54				2530.497	
208.05	2528.539	2529.039			
213.58					2530.888
213.7			2530.164		
221.45				2530.18	
226.79	2527.903	2528.903			
228.3				2532.121	
229.92					2530.372
234.24	2528.324	2528.924			
238.93			2529.819		
242.53	2528.436	2528.736			
242.75				2531.372	
249.5					2529.917
254.21	2527.805	2528.205			
254.21				2530.843	
259.93	2527.303	2528.103			
264.85	2527.777	2527.977			
268.44	2527.621	2527.921			
272.56					2529.683
273.79	2527.25	2527.75			
274.17			2529.442		
277.73	2527.404	2527.854			
280.7					2529.626
284.59	2527.225	2527.725			
284.59				2530.653	
288.83	2526.67	2527.57			
294.85	2526.667	2527.517			
297.14					2530.049
299.03	2526.653	2527.503			
303.79			2529.04		
305.34					2530.28
305.82	2527.23	2527.53			
307.52				2529.871	
314.14	2527.047	2527.447			
319.38	2526.657	2527.257			
319.38				2530.134	
322.57					2529.25
325.65	2526.563	2527.313			
326.5			2528.629		
328.16				2529.312	
329.49					2531.048
331.78	2526.628	2527.228			
338.21				2529.194	
338.68			2528.403		
339.35	2526.802	2527.252			

344.5	2526.706	2527.056			
344.5					2530.875
347.96	2526.254	2526.854			
350.46			2528.244		
352.6				2528.88	
358.63	2526.245	2526.845			
362.42					2530.513
362.72	2526.106	2526.806			
368.49	2526.505	2526.755			
369.43				2528.857	
373.27	2526.225	2526.675			
375.97			2527.861		
376.78	2525.625	2526.575			
381.58	2525.544	2526.594			
381.58				2528.994	
389.54			2527.562		
390.88	2526.054	2526.504			
390.88					2530.199
396.41	2525.729	2526.429			
400.82	2526.07	2526.47			
406.8				2528.535	
407.14			2527.681		
408.86	2525.72	2526.02			
411.17	2525.399	2525.949			
414.49	2525.623	2525.923			
418.69					2528.774
418.93				2528.02	
419.75			2527.408		
423.66					2528.067
424.54	2525.451	2525.751			
428.01	2525.075	2525.775			
428.01				2530.012	
432.78	2525.473	2525.773			
436.88					2527.545
438.86	2525.163	2525.563			
438.86				2529.785	
443.16			2526.673		
444.67	2524.916	2525.616			
452.62	2525.118	2525.618			
455.84					2528.723
458.89			2526.795		
459.19	2525.003	2525.553		2527.642	

Cross Section Locations

Cross Section Name	Type	Profile Station
XS11 Riffle	Riffle	267.67
XS12 Pool	Pool	359.1

Measurements from Graph

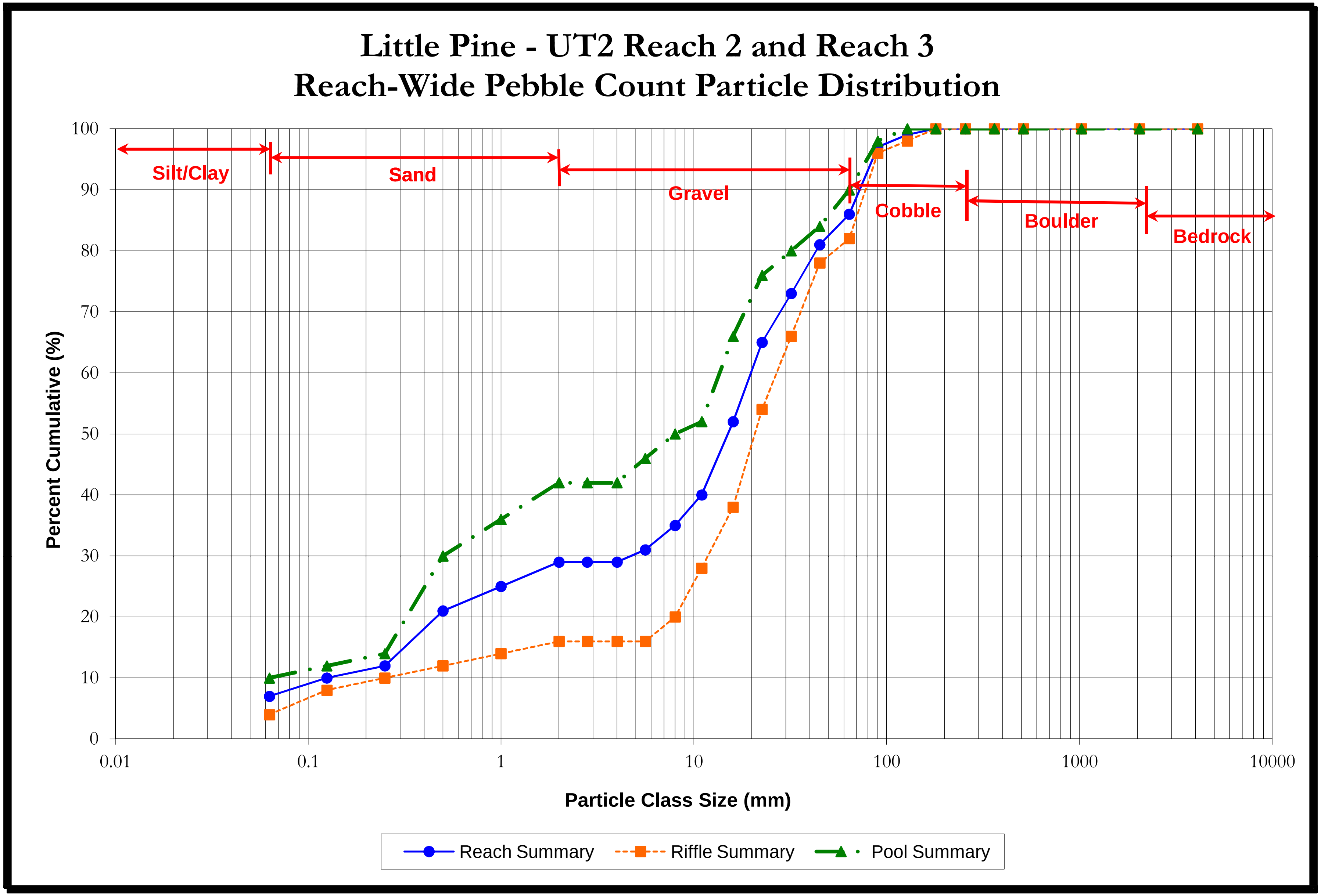
Bankfull Slope: 0.01223

Variable	Min	Avg	Max
S riffle	0.00918	0.03248	0.0678
S pool	0.0009	0.00444	0.00606
S run	0.00828	0.02123	0.04694
S glide	0	0.0042	0.01173
P - P	21.54	36.21	63.4
P length	14.63	21.4	31.29

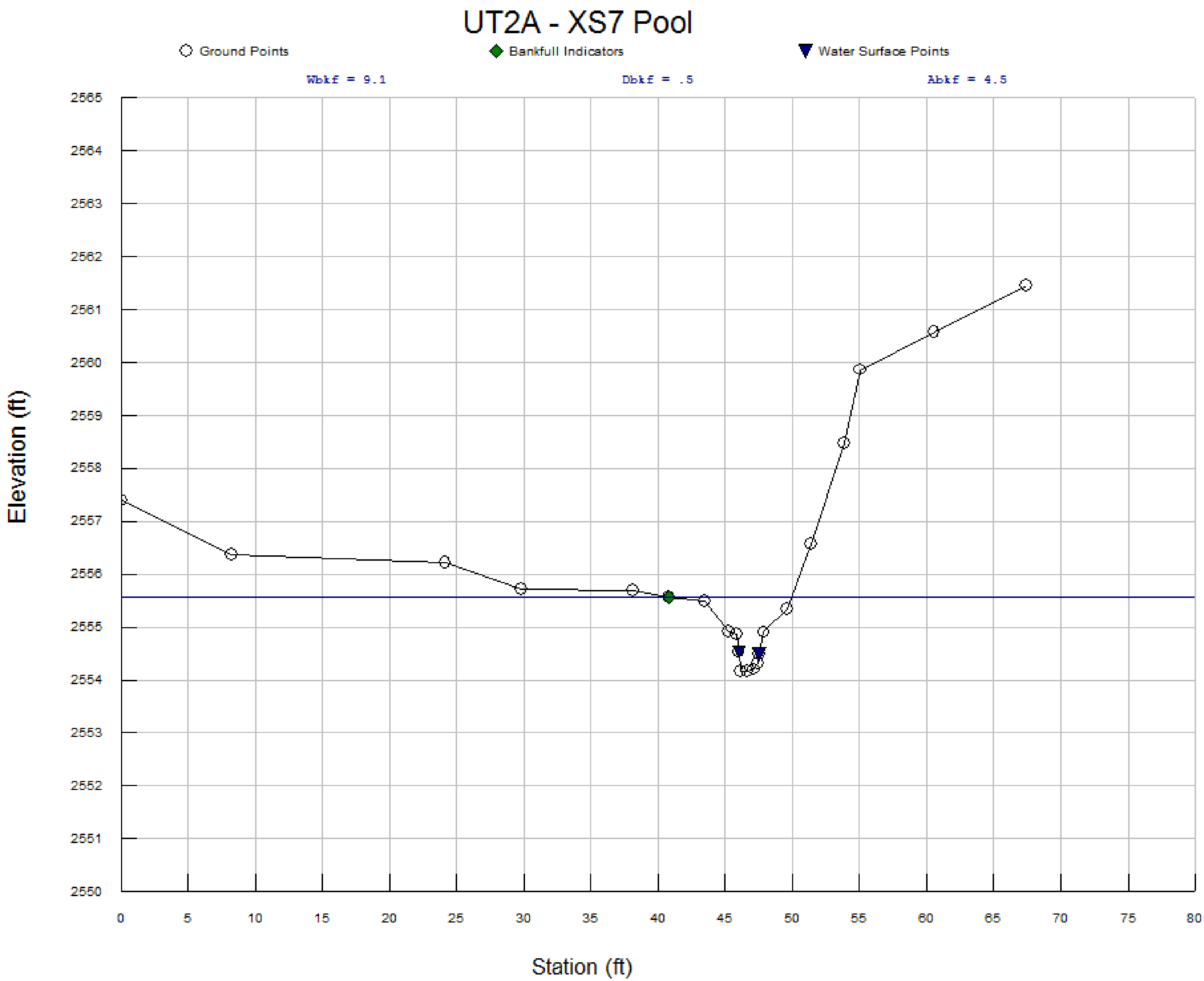
UT2 Lower Reach Profile Summary

Dmax riffle	1.16	1.41	1.79
Dmax pool	1.74	2.13	2.56
Dmax run	1.24	1.7	2.14
Dmax glide	1.43	1.71	2.04
Low Bank Ht	1.41	1.99	2.65

Length and depth measurements in feet, slopes in ft/ft.


Little Pine - UT2 Reach 2 and Reach 3
Reach-Wide Pebble Count Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
Particle Class Size (mm)
Reach Summary
Riffle Summary
Pool Summary

UT2A


UT2A - XS7 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 9.1
Dbkf = .5
Abkf = 4.5
Elevation (ft)
Station (ft)
2565
2564
2563
2562
2561
2560
2559
2558
2557
2556
2555
2554
2553
2552
2551
2550
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80

UT2A– XS7, looking downstream

UT2A – XS7, left bank

UT2A – XS7, right bank

XS7 Pool Summary - UT2A
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2A
Reach Name: Reach 1
Cross Section Name: XS7 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2557.396072	pool
8.26	0	2556.363426	
24.15	0	2556.216348	
29.79	0	2555.71052	
38.13	0	2555.696222	
40.8	0	2555.569934	bkf
43.5	0	2555.481673	
45.3	0	2554.919693	
45.87	0	2554.875298	
46.02	0	2554.526946	lew
46.14	0	2554.156258	
46.65	0	2554.155458	
47.14	0	2554.200508	
47.42	0	2554.30502	
47.57	0	2554.481117	rew
47.89	0	2554.902787	
49.63	0	2555.344423	
51.37	0	2556.576974	
53.84	0	2558.471369	
55.1	0	2559.863814	
60.55	0	2560.578853	
67.42	0	2561.458102	

Cross Sectional Geometry

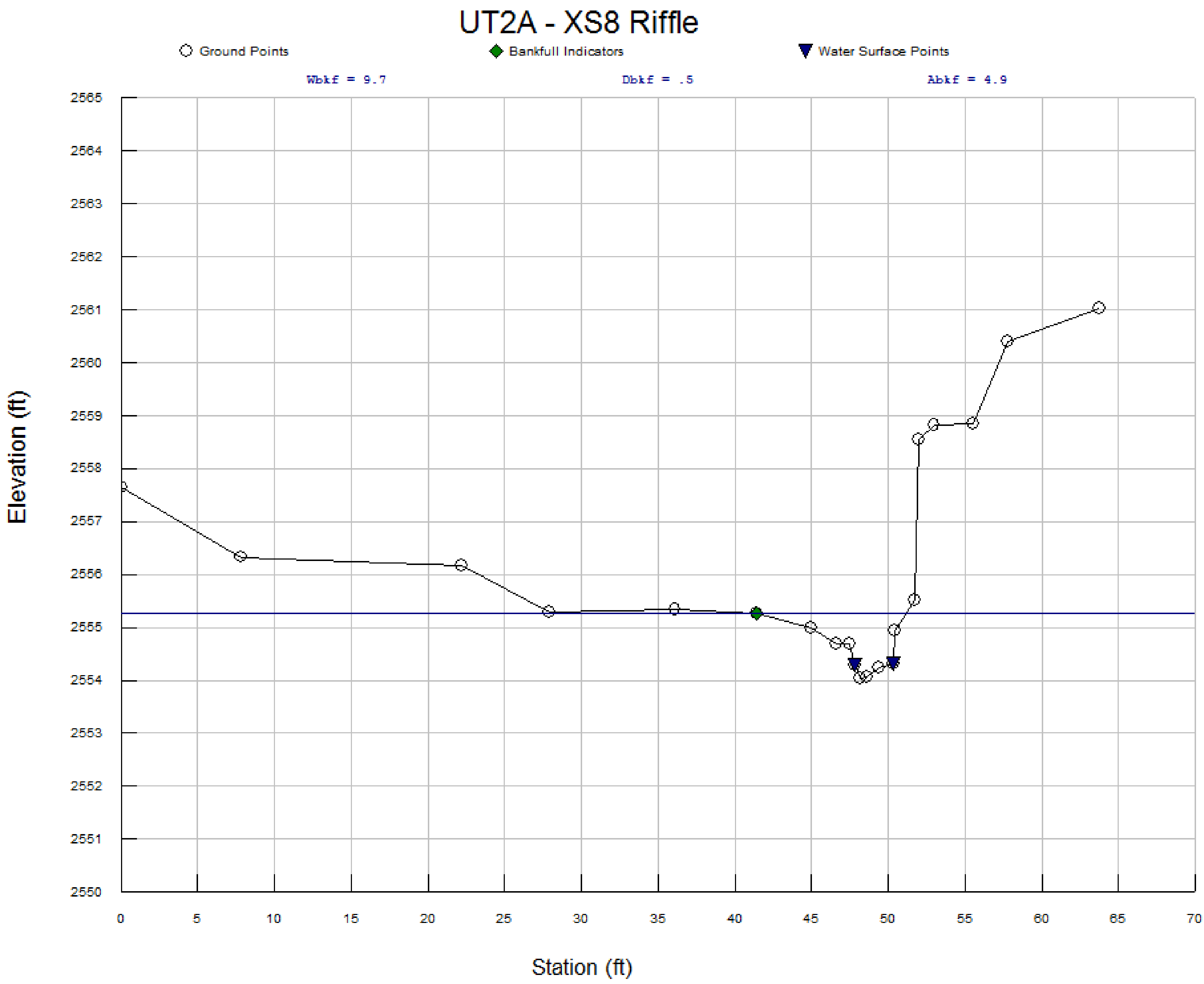
	Channel	Left	Right
Floodprone Elevation (ft)	2556.98	2556.98	2556.98
Bankfull Elevation (ft)	2555.57	2555.57	2555.57
Floodprone Width (ft)	48.61	-----	-----
Bankfull Width (ft)	9.15	4.57	4.58
Entrenchment Ratio	5.31	-----	-----
Mean Depth (ft)	0.49	0.18	0.8
Maximum Depth (ft)	1.41	0.66	1.41
Width/Depth Ratio	18.66	25.18	5.73
Bankfull Area (sq ft)	4.49	0.83	3.66
Wetted Perimeter (ft)	10.18	5.31	6.17
Hydraulic Radius (ft)	0.44	0.16	0.59
Begin BKF Station	40.8	40.8	45.37
End BKF Station	49.95	45.37	49.95

Entrainment Calculations

XS7 Pool Summary - UT2A

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT2A - XS8 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 9.7
Dbkf = .5
Abkf = 4.9
Elevation (ft)
Station (ft)
2565
2564
2563
2562
2561
2560
2559
2558
2557
2556
2555
2554
2553
2552
2551
2550
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70

UT2A– XS8, looking downstream


UT2A – XS8, looking upstream


UT2A – XS8, right bank

XS8 Riffle Summary - UT2A
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2A
Reach Name: Reach 1
Cross Section Name: XS8 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2557.641883	riffle
7.81	0	2556.326704	
22.22	0	2556.173609	
27.93	0	2555.298241	
36.11	0	2555.33314	
41.45	0	2555.271102	bkf
44.94	0	2554.985883	
46.59	0	2554.698649	
47.48	0	2554.697448	
47.82	0	2554.281643	lew
48.19	0	2554.039789	
48.64	0	2554.067122	
49.37	0	2554.230066	
50.32	0	2554.314112	rew
50.43	0	2554.941497	
51.75	0	2555.511911	
51.97	0	2558.548484	
52.99	0	2558.831114	
55.54	0	2558.848858	
57.79	0	2560.404533	
63.73	0	2561.024325	

Cross Sectional Geometry

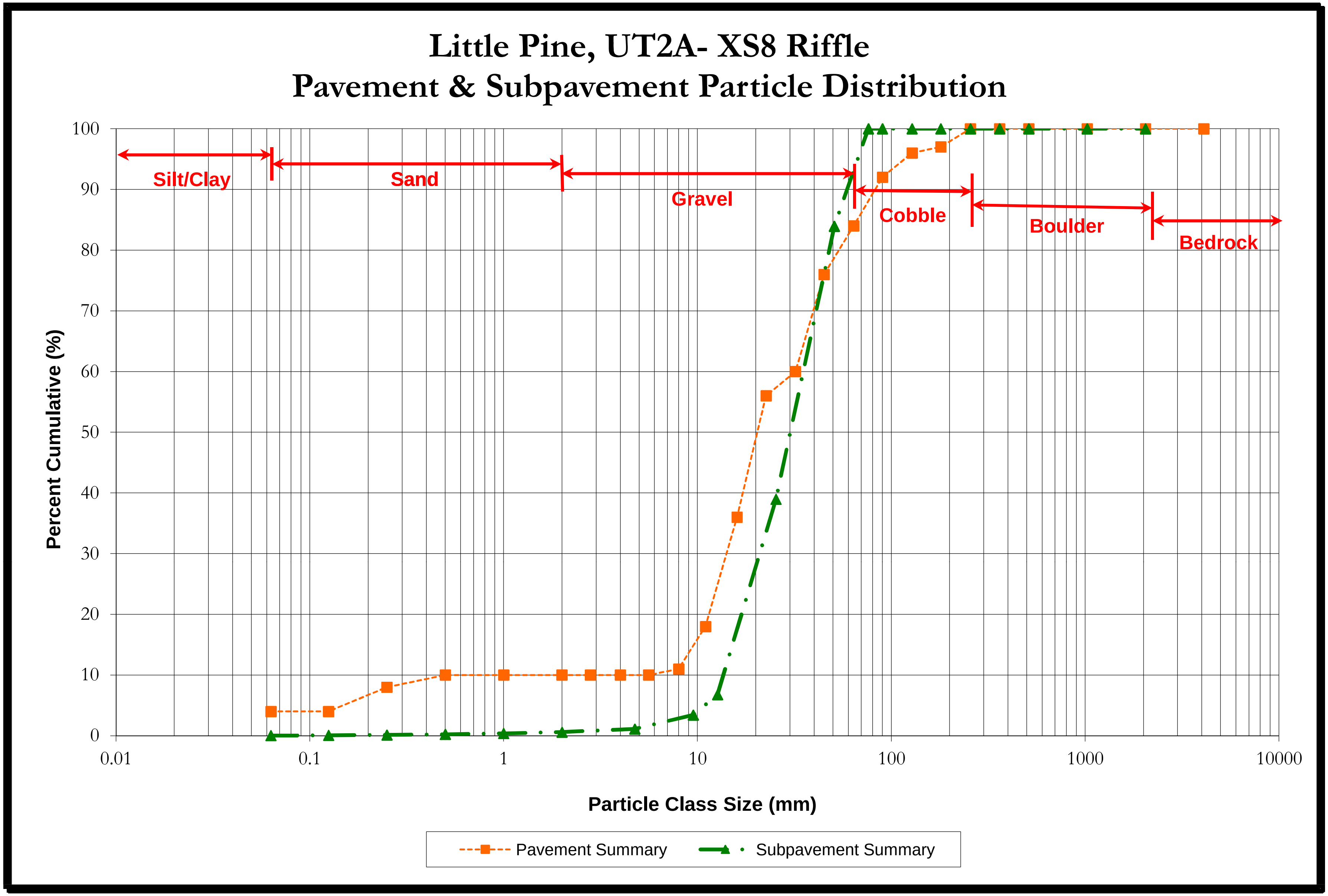
	Channel	Left	Right
Floodprone Elevation (ft)	2556.5	2556.5	2556.5
Bankfull Elevation (ft)	2555.27	2555.27	2555.27
Floodprone Width (ft)	45.04	-----	-----
Bankfull Width (ft)	9.73	4.87	4.86
Entrenchment Ratio	4.63	-----	-----
Mean Depth (ft)	0.5	0.22	0.79
Maximum Depth (ft)	1.23	0.53	1.23
Width/Depth Ratio	19.33	22.41	6.16
Bankfull Area (sq ft)	4.89	1.06	3.84
Wetted Perimeter (ft)	10.65	5.43	6.28
Hydraulic Radius (ft)	0.46	0.19	0.61
Begin BKF Station	41.46	41.46	46.33
End BKF Station	51.19	46.33	51.19

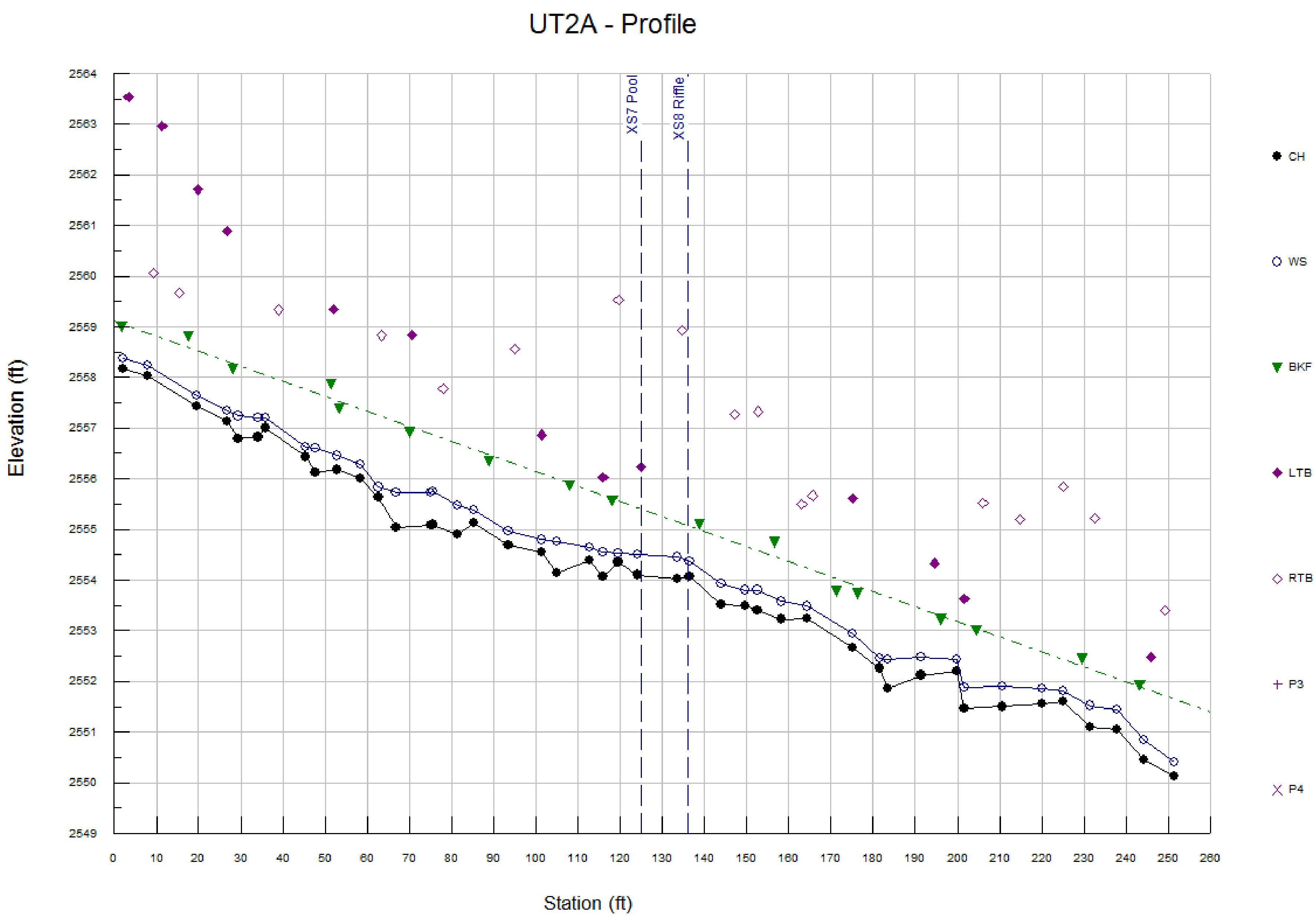
Entrainment Calculations

XS8 Riffle Summary - UT2A

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Little Pine, UT2A- XS8 Riffle
Pavement & Subpavement Particle Distribution
Percent Cumulative (%)
Particle Class Size (mm)
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Pavement Summary
Subpavement Summary



UT2A - Profile
Elevation (ft)
Station (ft)
XS7 Pool
XS8 Riffle
CH
WS
BKF
LTB
RTB
P3
P4
2549
2550
2551
2552
2553
2554
2555
2556
2557
2558
2559
2560
2561
2562
2563
2564
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
220
230
240
250
260

UT2A Profile Summary
RIVERMORPH PROFILE SUMMARY

River Name: UT2A
Reach Name: Reach 1
Profile Name: Profile 1
Survey Date: 05/04/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
1.76			2558.997		
2.03	2558.172	2558.372			
3.36				2563.53	
8	2558.033	2558.233			
9.27					2560.057
11.38				2562.957	
15.36					2559.667
17.58			2558.822		
19.5	2557.436	2557.636			
19.89				2561.706	
26.86	2557.14	2557.34			
26.86				2560.888	
28.09			2558.169		
29.47	2556.791	2557.241			
34.11	2556.824	2557.204			
35.84	2557.006	2557.206			
38.96					2559.334
45.29	2556.43	2556.63			
47.74	2556.119	2556.609			
51.44			2557.878		
52.08				2559.354	
52.9	2556.177	2556.457			
53.4			2557.392		
58.44	2556.009	2556.289			
62.69	2555.633	2555.833			
63.3					2558.83
66.87	2555.029	2555.729			
70.13			2556.913		
70.56				2558.844	
75.11	2555.085	2555.735			
75.54	2555.096	2555.746			
78.01					2557.785
81.35	2554.899	2555.479			
85.39	2555.127	2555.377			
88.98			2556.351		
93.48	2554.686	2554.966			
95.02					2558.554
101.47	2554.549	2554.799			
101.47				2556.868	
105.05	2554.145	2554.765			
108.09			2555.861		
112.76	2554.401	2554.651			
115.95	2554.061	2554.561			
115.95				2556.025	
118.16			2555.567		
119.55	2554.356	2554.536			
119.55					2559.533

124.22	2554.101	2554.501			
125.05				2556.237	
133.54	2554.03	2554.45			
134.75					2558.933
136.49	2554.066	2554.366			
138.77			2555.107		
143.94	2553.523	2553.923			
147.22					2557.271
149.7	2553.502	2553.802			
152.57	2553.401	2553.801			
152.81					2557.327
156.51			2554.752		
158.31	2553.226	2553.576			
163.04					2555.505
164.25	2553.236	2553.486			
165.62					2555.67
171.3			2553.786		
175.22	2552.664	2552.944			
175.22				2555.614	
176.33			2553.732		
181.61	2552.261	2552.461			
183.44	2551.851	2552.441			
191.35	2552.124	2552.474			
194.54				2554.332	
196.07			2553.232		
199.79	2552.209	2552.429			
201.61	2551.466	2551.886			
201.61				2553.634	
204.46			2553.013		
206.08					2555.523
210.74	2551.502	2551.902			
214.82					2555.193
220.02	2551.56	2551.86			
225.14	2551.607	2551.807			
225.14					2555.837
229.43			2552.443		
231.47	2551.091	2551.521			
232.53					2555.215
237.84	2551.049	2551.449			
243.23			2551.932		
244.16	2550.457	2550.837			
245.81				2552.483	
249.22					2553.4
251.55	2550.135	2550.405			

Cross Section Locations

Cross Section Name	Type	Profile Station
XS7 Pool	Riffle	125.23
XS8 Riffle	Riffle	135.86

Measurements from Graph

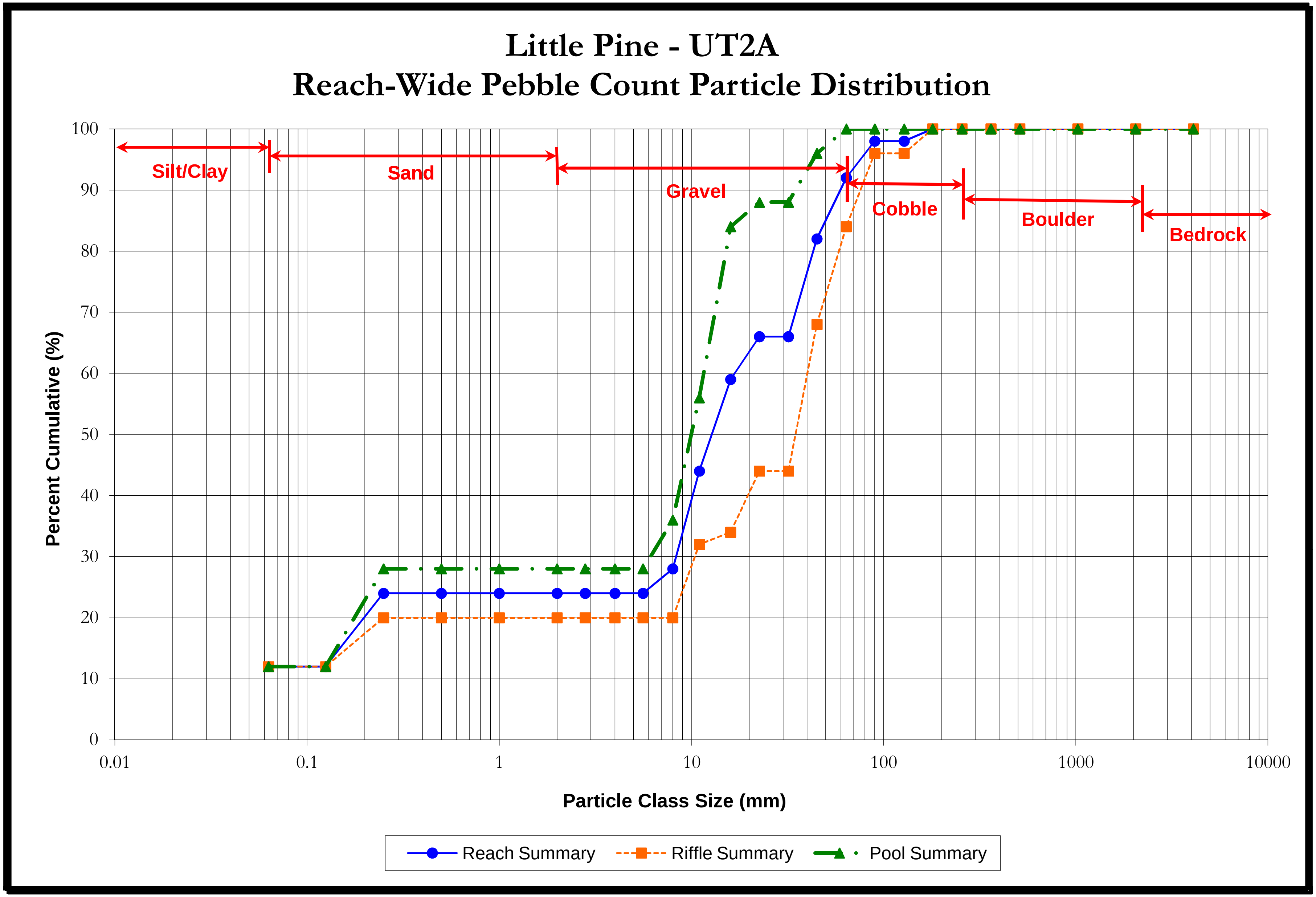
Bankfull Slope: 0.02956

Variable	Min	Avg	Max
S riffle	0.03559	0.05088	0.06180
S pool	0.00208	0.01120	0.02642
S run	0.01384	0.02744	0.04530
S glide	0.00244	0.01202	0.02166

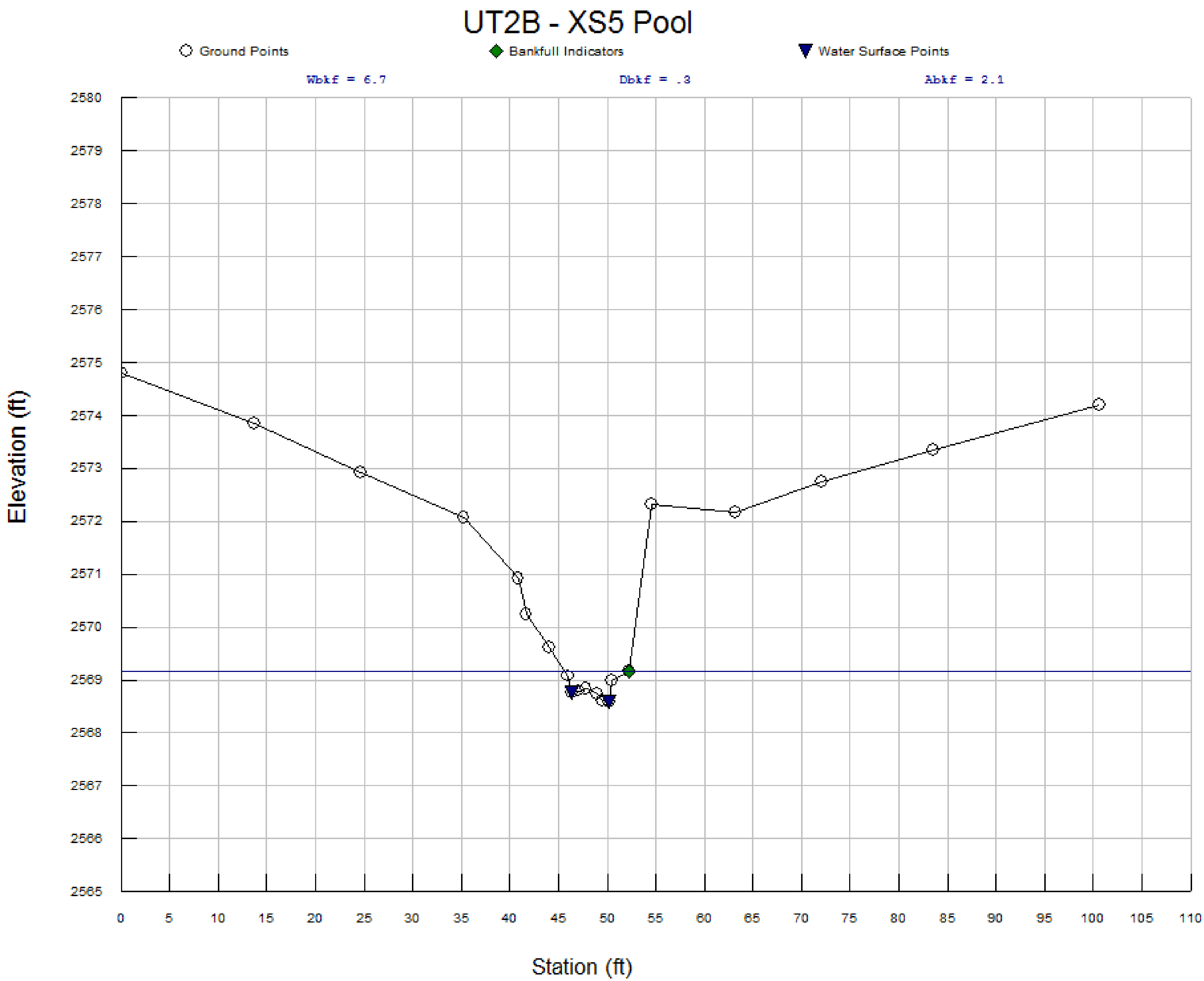
UT2A Profile Summary

P - P	17.23	29.40	58.57
P length	7.81	14.70	22.28
Dmax riffle	0.86	1.16	1.41
Dmax pool	1.43	1.68	2.00
Dmax run	1.20	1.45	1.66
Dmax glide	1.18	1.32	1.56
Low Bank Ht	1.39	2.11	3.20

Length and depth measurements in feet, slopes in ft/ft.


Little Pine - UT2A
Reach-Wide Pebble Count Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
100
90
80
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Reach Summary
Riffle Summary
Pool Summary

UT2B


UT2B - XS5 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.7
Dbkf = .3
Abkf = 2.1
Elevation (ft)
2580
2579
2578
2577
2576
2575
2574
2573
2572
2571
2570
2569
2568
2567
2566
2565
Station (ft)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
105
110

UT2B– XS5, looking downstream

UT2B – XS5, left bank

UT2B – XS5, right bank

XS5 Pool Summary - UT2B
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2B
Reach Name: Reach 1
Cross Section Name: XS5 Pool
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2574.806143	pool
13.69	0	2573.859825	
24.68	0	2572.915663	
35.25	0	2572.079056	
40.84	0	2570.924813	
41.67	0	2570.229456	
44.05	0	2569.621936	
45.92	0	2569.075671	-
46.36	0	2568.761395	lew
47.04	0	2568.798925	
47.81	0	2568.828787	
48.95	0	2568.742544	
49.54	0	2568.607368	
50.2	0	2568.590708	rew
50.48	0	2568.977925	
52.31	0	2569.16535	bkf
54.54	0	2572.312981	
63.23	0	2572.175647	
72.06	0	2572.756376	
83.5	0	2573.353406	
100.64	0	2574.204493	

Cross Sectional Geometry

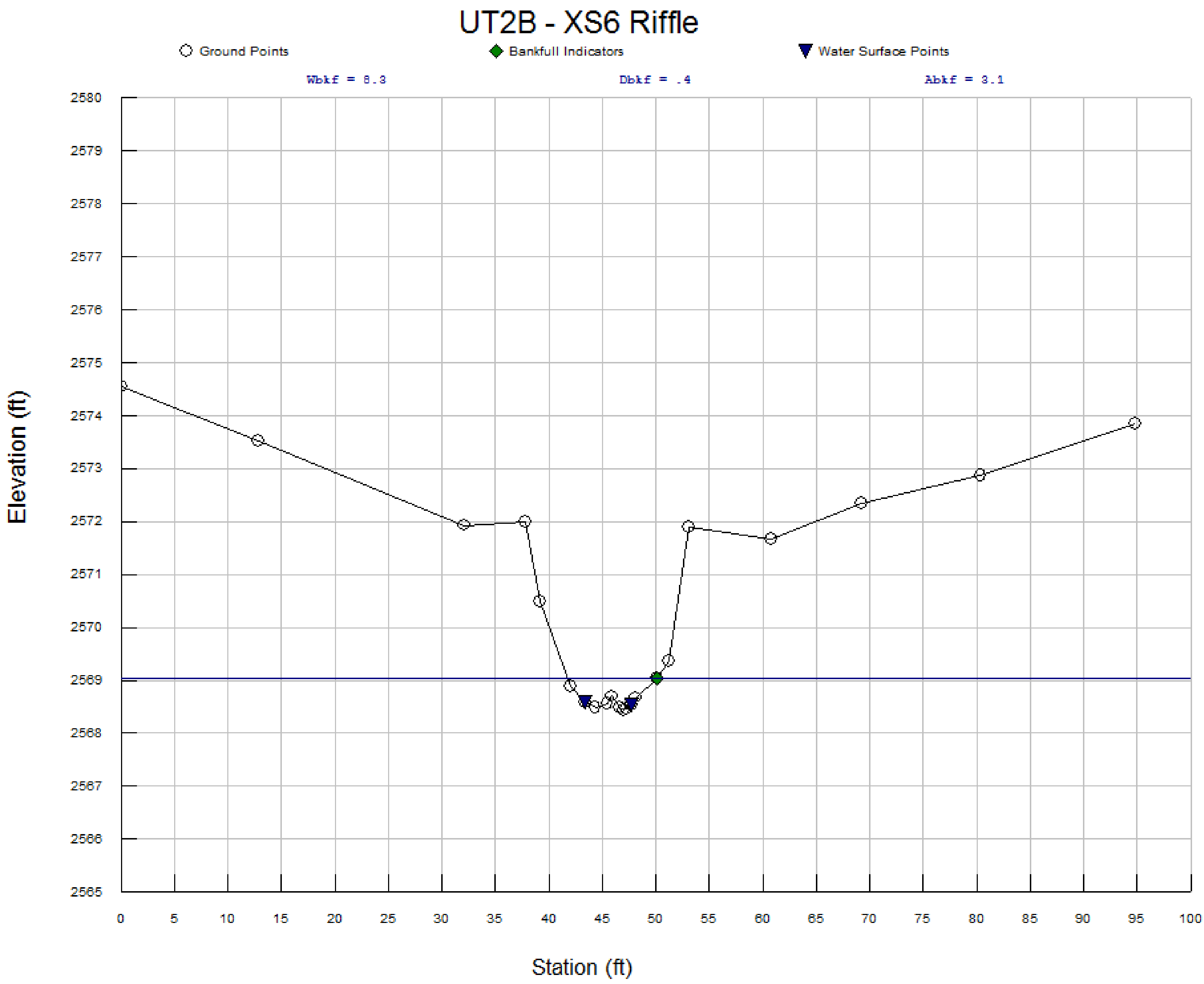
	Channel	Left	Right
Floodprone Elevation (ft)	2569.75	2569.75	2569.75
Bankfull Elevation (ft)	2569.17	2569.17	2569.17
Floodprone Width (ft)	9.17	-----	-----
Bankfull Width (ft)	6.72	3.09	3.62
Entrenchment Ratio	1.37	-----	-----
Mean Depth (ft)	0.31	0.32	0.29
Maximum Depth (ft)	0.58	0.41	0.58
Width/Depth Ratio	21.89	9.62	12.3
Bankfull Area (sq ft)	2.06	0.99	1.07
Wetted Perimeter (ft)	7.06	3.62	4.26
Hydraulic Radius (ft)	0.29	0.27	0.25
Begin BKF Station	45.6	45.6	48.69
End BKF Station	52.31	48.69	52.31

Entrainment Calculations

XS5 Pool Summary - UT2B

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT2B - XS6 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 8.3
Dbkf = .4
Abkf = 3.1
Elevation (ft)
Station (ft)
2580
2579
2578
2577
2576
2575
2574
2573
2572
2571
2570
2569
2568
2567
2566
2565
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

UT2B– XS6, looking downstream

	
UT2B – XS6, left bank	UT2B – XS6, right bank

XS6 Riffle Summary - UT2B
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2B
Reach Name: Reach 1
Cross Section Name: XS6 Riffle
Survey Date: 05/04/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2574.548867	riffle
12.88	0	2573.516501	
32.1	0	2571.929811	
37.86	0	2571.999854	
39.21	0	2570.492291	
42.07	0	2568.890364	
43.45	0	2568.590823	lew
44.34	0	2568.49435	
45.47	0	2568.561486	
45.86	0	2568.700987	
46.58	0	2568.49367	
46.96	0	2568.445101	
47.26	0	2568.467805	
47.76	0	2568.53268	rew
48.15	0	2568.674107	
50.13	0	2569.029742	bkf
51.19	0	2569.371937	
53.13	0	2571.89934	
60.83	0	2571.661584	
69.28	0	2572.346847	
80.36	0	2572.876698	
94.87	0	2573.842768	

Cross Sectional Geometry

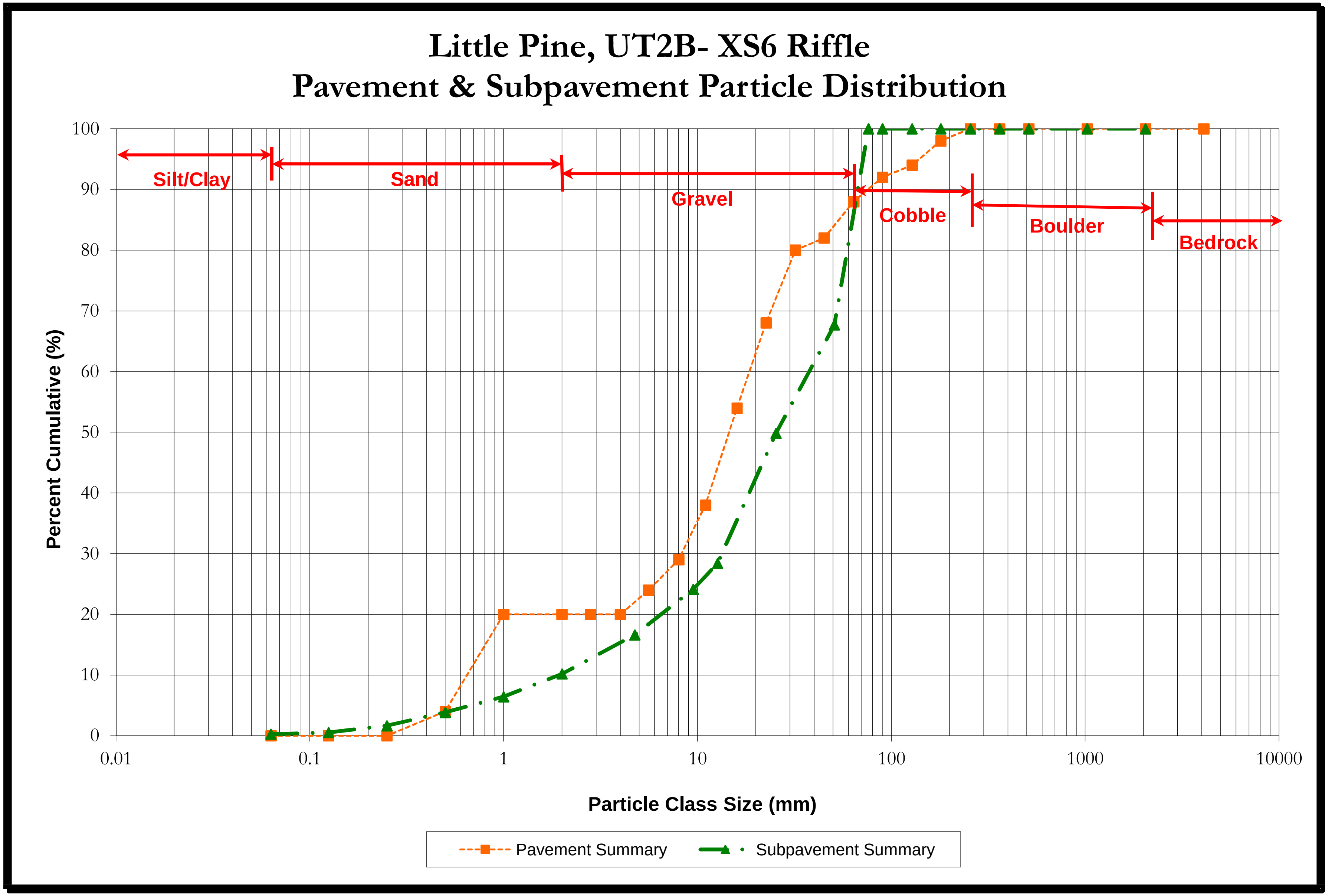
	Channel	Left	Right
Floodprone Elevation (ft)	2569.61	2569.61	2569.61
Bankfull Elevation (ft)	2569.03	2569.03	2569.03
Floodprone Width (ft)	10.6	-----	-----
Bankfull Width (ft)	8.31	4.16	4.15
Entrenchment Ratio	1.28	-----	-----
Mean Depth (ft)	0.37	0.39	0.35
Maximum Depth (ft)	0.58	0.54	0.58
Width/Depth Ratio	22.61	10.71	11.97
Bankfull Area (sq ft)	3.05	1.62	1.44
Wetted Perimeter (ft)	8.5	4.63	4.6
Hydraulic Radius (ft)	0.36	0.35	0.31
Begin BKF Station	41.82	41.82	45.98
End BKF Station	50.13	45.98	50.13

Entrainment Calculations

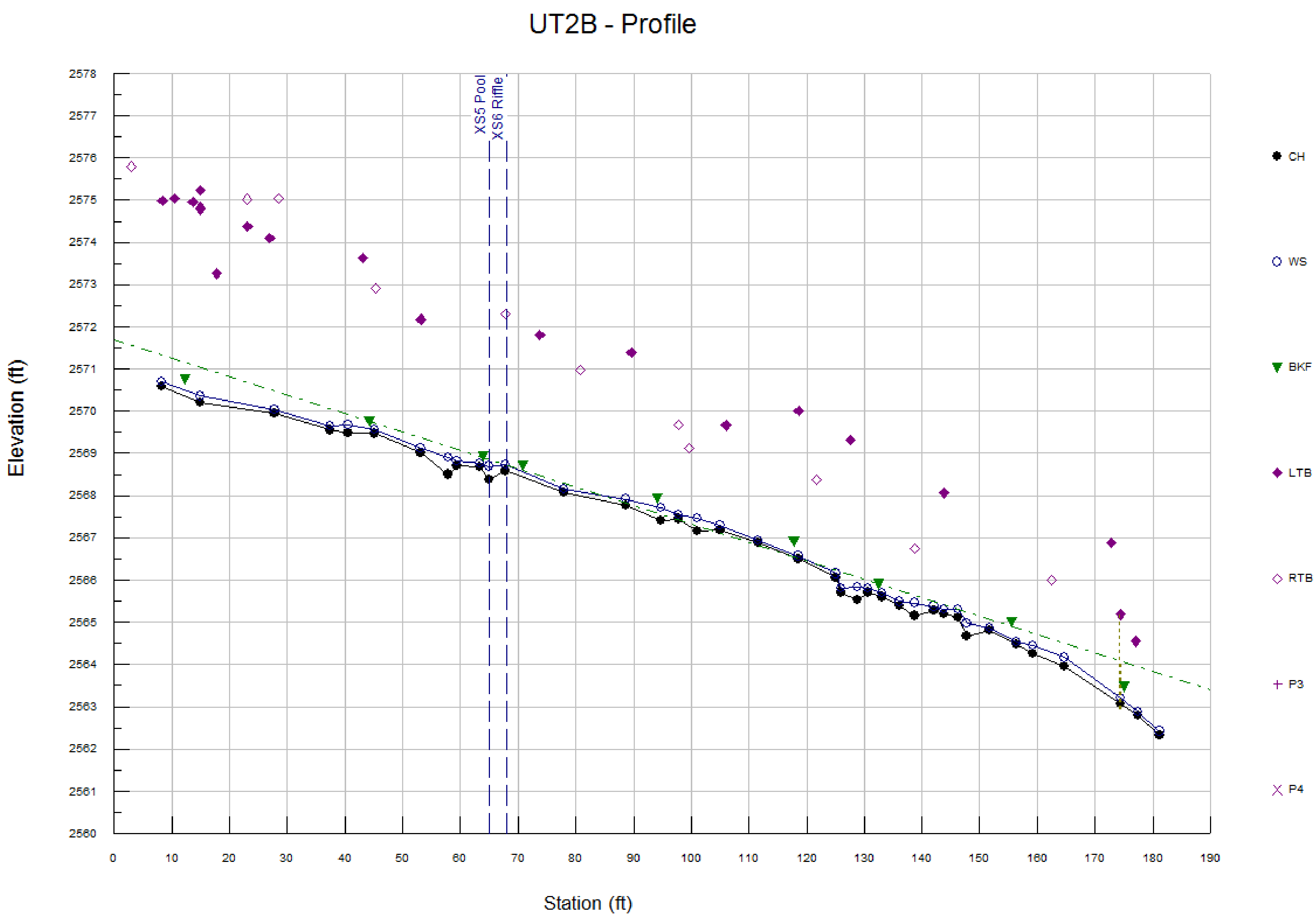
XS6 Riffle Summary - UT2B

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Little Pine, UT2B- XS6 Riffle
Pavement & Subpavement Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
Particle Class Size (mm)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Pavement Summary
Subpavement Summary



Distance =-.17 Depth = 2.22 Slope =-13.2281

UT2B Profile Summary
RIVERMORPH PROFILE SUMMARY

River Name: UT2B
Reach Name: Reach 1
Profile Name: Profile 1
Survey Date: 05/03/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
2.96					2575.797
8.21	2570.594	2570.694			
8.35				2574.989	
10.39				2575.035	
12.34			2570.748		
13.61				2574.962	
15	2570.21	2570.36			
15				2574.831	
15				2575.225	
15				2574.777	
17.75				2573.259	
22.99					2575.022
23.11				2574.38	
26.96				2574.099	
27.79	2569.947	2570.047			
28.54					2575.036
37.46	2569.556	2569.656			
40.52	2569.479	2569.679			
43.04				2573.631	
44.19			2569.768		
45.11	2569.471	2569.571			
45.28					2572.916
53.14	2569.019	2569.119			
53.14				2572.178	
57.84	2568.499	2568.899			
59.4	2568.713	2568.813			
63.34	2568.688	2568.758			
63.93			2568.924		
65.05	2568.374	2568.694			
67.85	2568.586	2568.736			
67.85					2572.306
70.86			2568.713		
73.79				2571.8	
78	2568.082	2568.152			
80.72					2570.969
88.66	2567.769	2567.919			
89.64				2571.384	
94.09			2567.934		
94.79	2567.408	2567.708			
97.85	2567.452	2567.552			
97.85					2569.678
99.67					2569.134
101.08	2567.165	2567.465			
104.98	2567.193	2567.293			
106.01				2569.664	
111.66	2566.885	2566.935			
117.78			2566.92		

118.57	2566.495	2566.565			
118.57				2570.002	
121.72					2568.382
125.09	2566.054	2566.154			
125.99	2565.712	2565.812			
127.61				2569.307	
128.77	2565.541	2565.841			
130.6	2565.709	2565.809			
132.52			2565.902		
133.03	2565.6	2565.7			
136.13	2565.392	2565.492			
138.79	2565.158	2565.458			
138.79					2566.755
142.05	2565.276	2565.376			
143.78	2565.205	2565.305			
143.78				2568.059	
146.31	2565.116	2565.306			
147.78	2564.679	2564.979			
151.77	2564.807	2564.857			
155.6			2565.011		
156.39	2564.486	2564.536			
159.22	2564.255	2564.455			
162.53					2566.002
164.63	2563.963	2564.163			
172.77				2566.886	
174.37	2563.063	2563.213			
174.37				2565.188	
174.98			2563.477		
177.07				2564.553	
177.44	2562.786	2562.886			
181.2	2562.32	2562.42			

Cross Section Locations

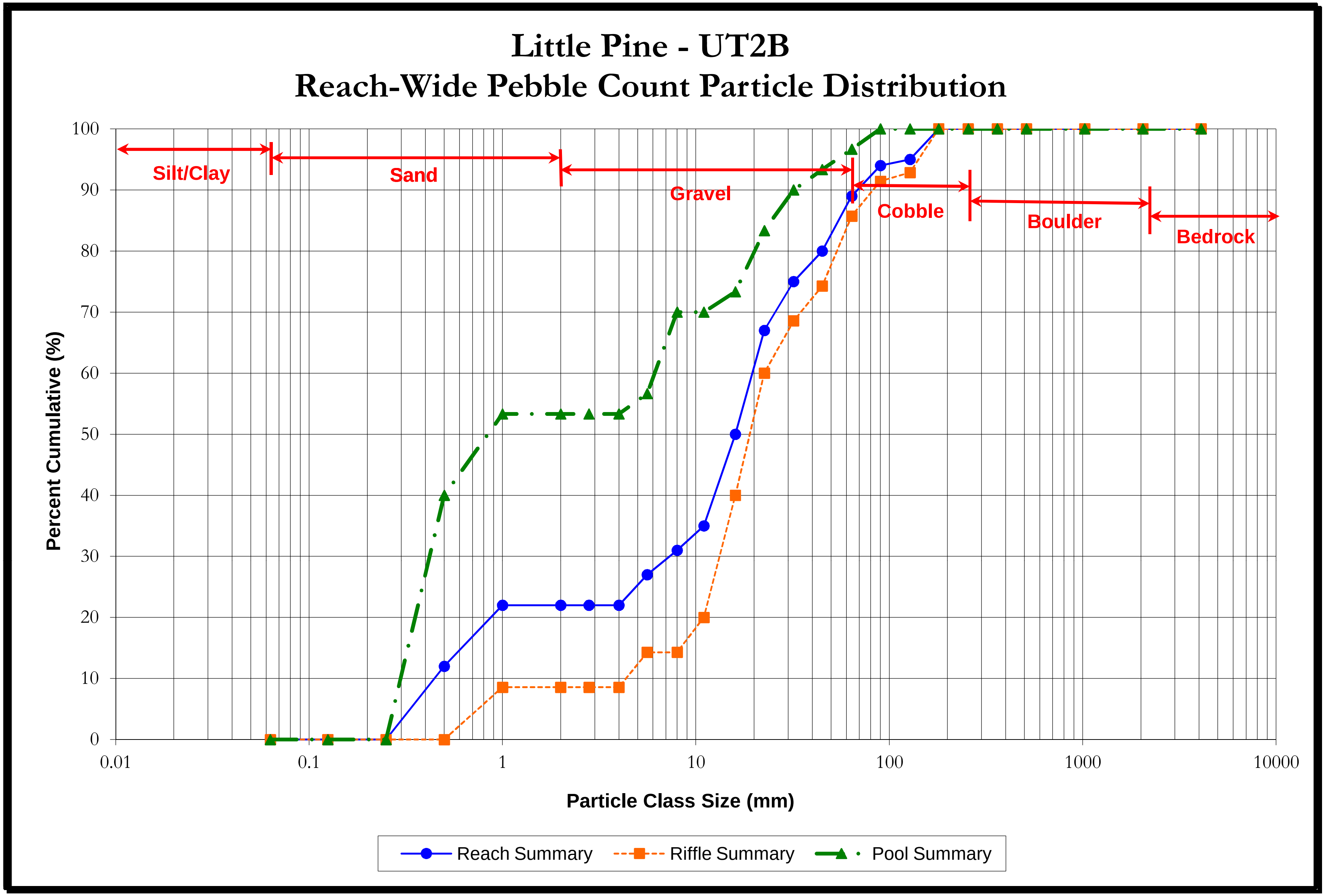
Cross Section Name	Type	Profile Station
XS5 Pool	Pool	65.05
XS6 Riffle	Riffle	67.85

Measurements from Graph

Bankfull Slope: 0.04377

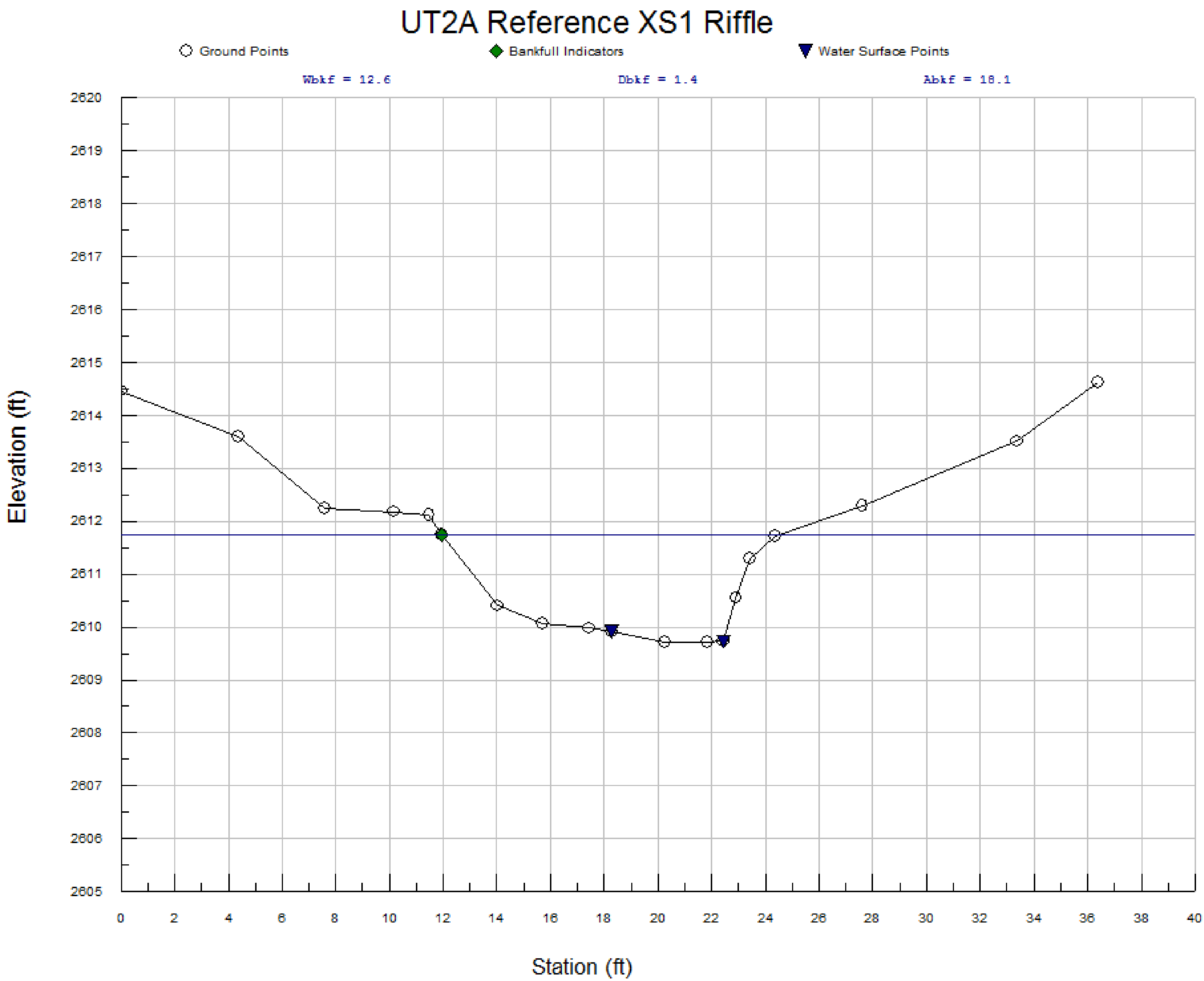
Variable	Min	Avg	Max
S riffle	0.01779	0.04888	0.08081
S pool	0.00000	0.01680	0.03978
S run	0.01604	0.04130	0.06819
S glide	0.00852	0.03437	0.10228
P - P	8.06	18.27	34.41
P length	4.70	5.49	7.22
Dmax riffle	0.37	0.44	0.50
Dmax pool	0.60	0.68	0.73
Dmax run	0.43	0.51	0.57
Dmax glide	0.46	0.50	0.55
Low Bank Ht	1.56	2.74	4.30

Length and depth measurements in feet, slopes in ft/ft.



Little Pine - UT2B
Reach-Wide Pebble Count Particle Distribution
Silt/Clay
Sand
Gravel
Cobble
Boulder
Bedrock
Percent Cumulative (%)
0
10
20
30
40
50
60
70
80
90
100
0.01
0.1
1
10
100
1000
10000
Particle Class Size (mm)
Reach Summary
Riffle Summary
Pool Summary

Reference Reach – UT2A


UT2A Reference XS1 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 12.6
Dbkf = 1.4
Abkf = 18.1
Elevation (ft)
Station (ft)
2620
2619
2618
2617
2616
2615
2614
2613
2612
2611
2610
2609
2608
2607
2606
2605
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40


UT2A – Reference Reach, XS1, looking downstream


UT2A – Reference Reach, XS1, right bank

Reference UT2A XS1 Riffle
RIVERMORPH CROSS SECTION SUMMARY

River Name: Reference UT2A
Reach Name: Reach 1
Cross Section Name: UT2A Reference XS1 Riffle
Survey Date: 07/23/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2614.4618	RIFFLE
4.36	0	2613.6052	
7.58	0	2612.2427	
10.17	0	2612.1806	
11.47	0	2612.11	
11.94	0	2611.7512	BKF
14.04	0	2610.4078	
15.7	0	2610.0584	
17.43	0	2609.981	
18.29	0	2609.9093	LEW
20.27	0	2609.7117	
21.84	0	2609.7227	
22.43	0	2609.7261	REW
22.9	0	2610.5523	
23.43	0	2611.3026	
24.36	0	2611.7222	
27.61	0	2612.286	
33.36	0	2613.51	
36.37	0	2614.6145	

Cross Sectional Geometry

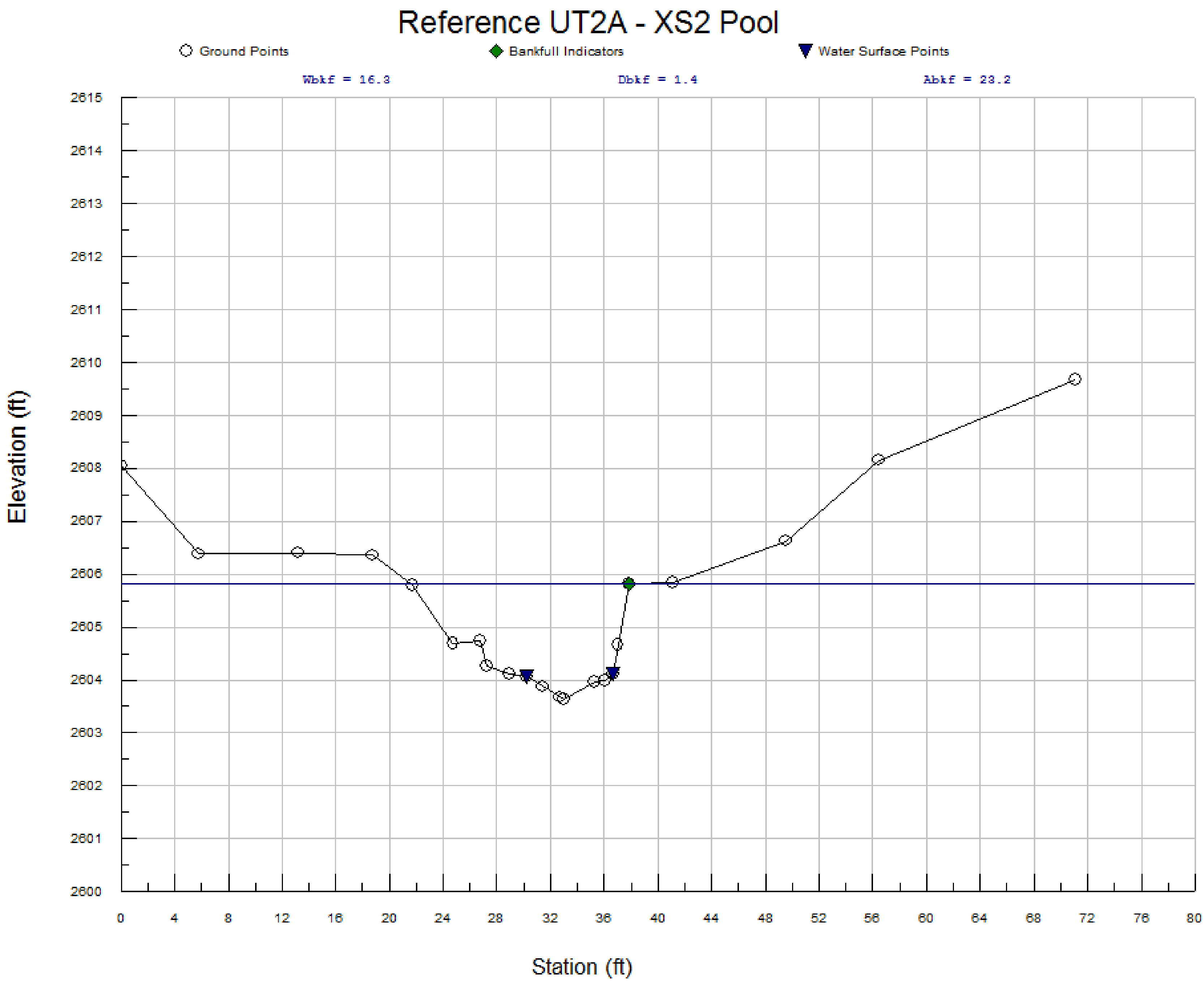
	Channel	Left	Right
Floodprone Elevation (ft)	2613.79	2613.79	2613.79
Bankfull Elevation (ft)	2611.75	2611.75	2611.75
Floodprone Width (ft)	30.69	-----	-----
Bankfull Width (ft)	12.58	6.29	6.29
Entrenchment Ratio	2.44	-----	-----
Mean Depth (ft)	1.44	1.33	1.55
Maximum Depth (ft)	2.04	1.84	2.04
Width/Depth Ratio	8.73	4.73	4.06
Bankfull Area (sq ft)	18.11	8.36	9.75
Wetted Perimeter (ft)	13.98	8.56	9.1
Hydraulic Radius (ft)	1.3	0.98	1.07
Begin BKF Station	11.94	11.94	18.23
End BKF Station	24.52	18.23	24.52

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

Reference UT2A XS1 Riffle

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Reference UT2A - XS2 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 16.3
Dbkf = 1.4
Abkf = 23.2
Elevation (ft)
Station (ft)

UT2A – Reference Reach, XS2, looking downstream

UT2A – Reference Reach, XS2, right bank

Reference UT2A XS2 Pool

RIVERMORPH CROSS SECTION SUMMARY

River Name: Reference UT2A
Reach Name: Reach 1
Cross Section Name: UT2A Reference - XS2 Pool
Survey Date: 07/23/12

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	2608.0536	POOL
5.79	0	2606.3821	
13.2	0	2606.4041	
18.73	0	2606.3594	
21.68	0	2605.7891	
24.73	0	2604.7009	
26.75	0	2604.7348	
27.22	0	2604.2565	
28.93	0	2604.115	
30.2	0	2604.0575	LEW
31.39	0	2603.8771	
32.68	0	2603.6781	
33.02	0	2603.6377	
35.24	0	2603.9543	
36.06	0	2603.987	
36.66	0	2604.1103	REW
37	0	2604.6716	
37.85	0	2605.8206	BKF
41.12	0	2605.8406	
49.54	0	2606.6296	
56.42	0	2608.1551	
71.07	0	2609.6703	

Cross Sectional Geometry

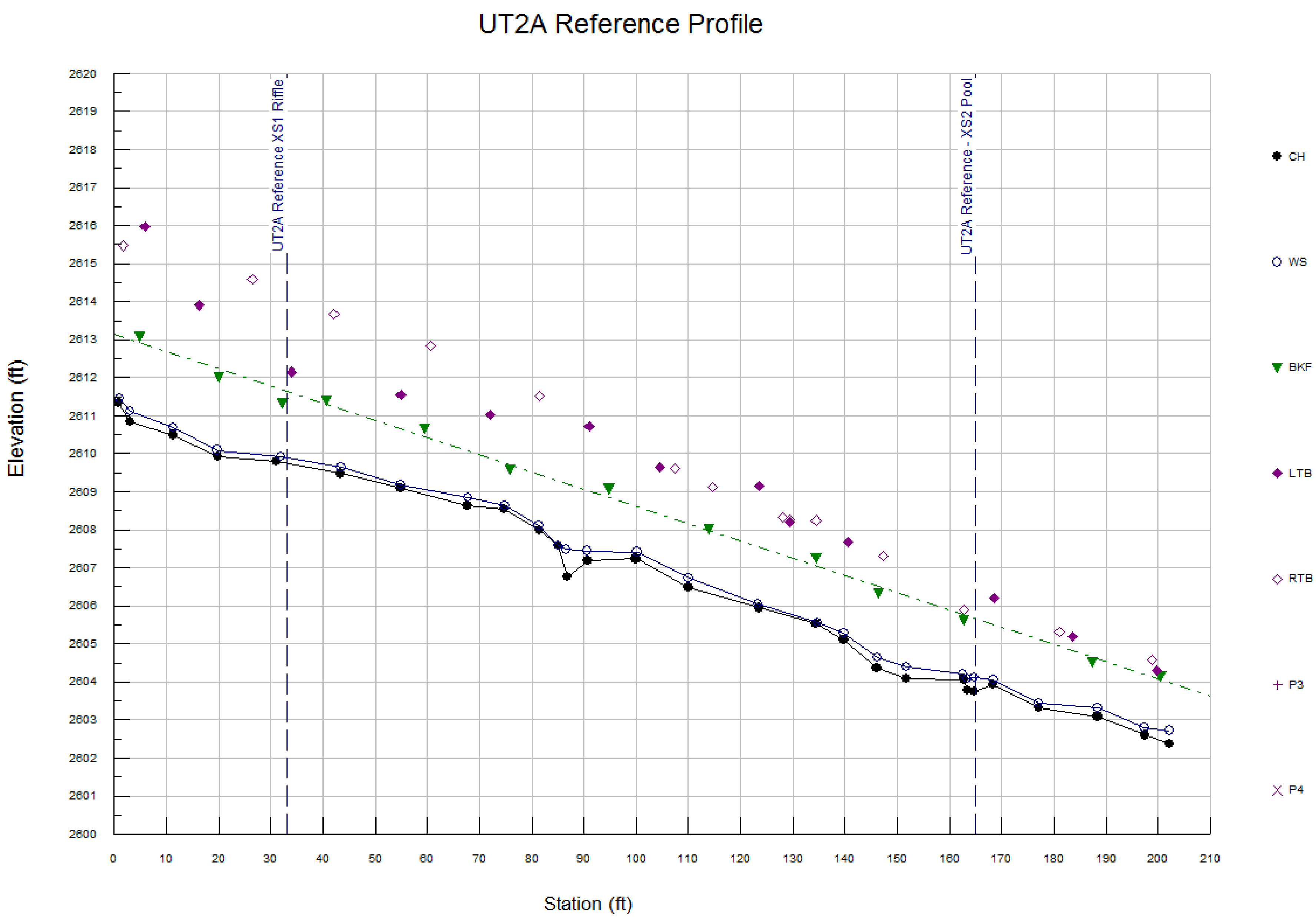
	Channel	Left	Right
Floodprone Elevation (ft)	2608	2608	2608
Bankfull Elevation (ft)	2605.82	2605.82	2605.82
Floodprone Width (ft)	55.55	-----	-----
Bankfull Width (ft)	16.33	8.16	8.17
Entrenchment Ratio	3.4	-----	-----
Mean Depth (ft)	1.42	1.07	1.78
Maximum Depth (ft)	2.18	1.74	2.18
Width/Depth Ratio	11.48	7.66	4.59
Bankfull Area (sq ft)	23.22	8.69	14.53
Wetted Perimeter (ft)	17.69	10.3	10.87
Hydraulic Radius (ft)	1.31	0.84	1.34
Begin BKF Station	21.52	21.52	29.68
End BKF Station	37.85	29.68	37.85

Entrainment Calculations

Reference UT2A XS2 Pool

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



UT2A Reference Profile
Elevation (ft)
Station (ft)
UT2A Reference XS1 Riffle
UT2A Reference - XS2 Pool
2620
2619
2618
2617
2616
2615
2614
2613
2612
2611
2610
2609
2608
2607
2606
2605
2604
2603
2602
2601
2600
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
CH
WS
BKF
LTB
RTB
P3
P4


UT2A – Reference Reach


UT2A – Reference Reach


UT2A – Reference Reach


UT2A – Reference Reach


UT2A – Reference Reach


UT2A – Reference Reach

UT2A Reference
RIVERMORPH PROFILE SUMMARY

River Name: Reference UT2A
Reach Name: Reach 1
Profile Name: UT2A Reference Profile
Survey Date: 07/23/12

Survey Data

DIST	CH	WS	BKF	LTB	RTB
0.8	2611.33				
0.96		2611.45			
1.67					2615.47
2.98		2611.12			
3	2610.85				
4.9			2613.07		
5.84				2615.98	
11.41	2610.49				
11.41		2610.69			
16.23				2613.9	
19.73		2610.09			
19.92	2609.92				
20.03			2612.01		
26.48					2614.59
31.02	2609.8				
31.93		2609.92			
32.27			2611.33		
33.99				2612.15	
40.63			2611.4		
42.11					2613.67
43.45	2609.48				
43.48		2609.65			
54.86		2609.19			
54.91	2609.09				
54.91				2611.55	
59.53			2610.67		
60.53					2612.85
67.67	2608.63				
67.82		2608.86			
72.09				2611.03	
74.67	2608.54				
74.83		2608.63			
75.93			2609.58		
81.32		2608.12			
81.37					2611.53
81.42	2607.99				
84.95		2607.6			
85.11	2607.58				
86.6		2607.48			
86.85	2606.75				
90.67		2607.45			
90.75	2607.18				
90.96				2610.72	
94.75			2609.08		
99.94	2607.24				
100.15		2607.42			
104.53				2609.65	

107.46					2609.61
109.97	2606.49				
110.04		2606.73			
113.86			2608.02		
114.62					2609.13
123.34		2606.05			
123.51	2605.95				
123.51				2609.16	
128.02					2608.33
129.39				2608.21	
129.4					2608.27
134.45	2605.53				
134.45			2607.25		
134.45					2608.25
134.69		2605.57			
139.78	2605.09				
139.78		2605.28			
140.65				2607.69	
146.08	2604.37				
146.11		2604.63			
146.47			2606.32		
147.29					2607.3
151.71		2604.39			
151.79	2604.08				
162.55		2604.21			
162.74	2604.07				
162.74			2605.63		
162.74					2605.89
163.48		2604.08			
163.51	2603.78				
164.77	2603.75				
164.79		2604.13			
168.38	2603.93				
168.45		2604.05			
168.65				2606.21	
177.16	2603.32				
177.16		2603.45			
181.01					2605.31
183.62				2605.19	
187.31			2604.51		
188.42	2603.09				
188.42		2603.31			
197.35		2602.8			
197.44	2602.6				
198.79					2604.57
199.74				2604.3	
200.48			2604.14		
202.13	2602.37	2602.72			

Cross Section Locations

Cross Section Name	Type	Profile Station
UT2A Reference XS1 Riffle	Riffle	33.11
UT2A Reference - XS2 Pool	Riffle	164.92

Measurements from Graph

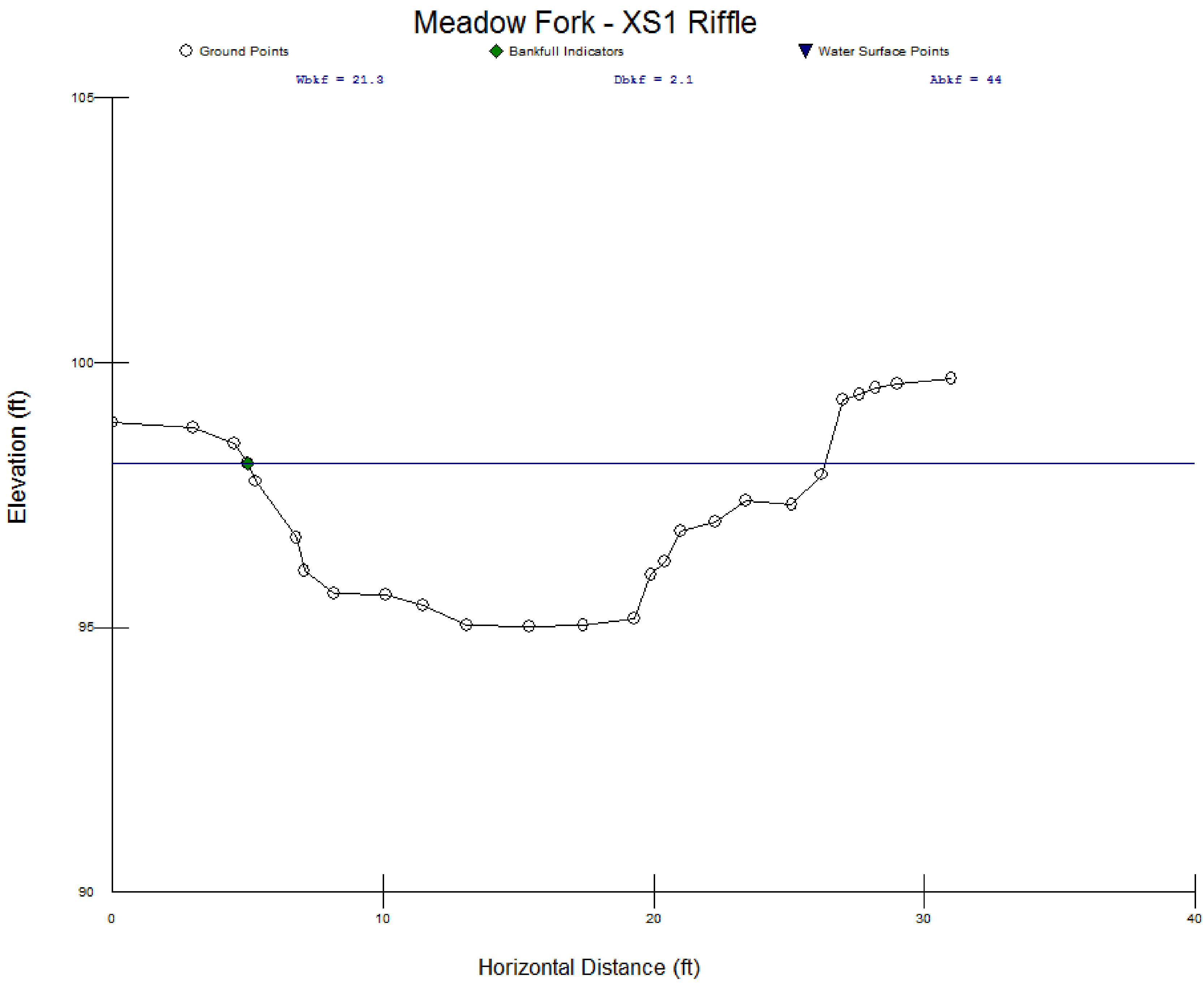
Bankfull Slope: 0.04526

Variable	Min	Avg	Max

	UT2A Reference		
S riffle	0.04037	0.04588	0.05166
S pool	0.00993	0.01182	0.01371
S run	0.01769	0.03822	0.05875
S glide	0.00839	0.01399	0.01958
P - P	77.55	77.55	77.55
P length	5.57	9.74	13.91
Dmax riffle	1.2	1.69	2.29
Dmax pool	1.98	2.24	2.49
Dmax run	1.7	1.86	2.01
Dmax glide	1.73	1.82	1.91
Low Bank Ht	2.01	2.68	4.63

Length and depth measurements in feet, slopes in ft/ft.

Reference Reach – Meadow Fork



Meadow Fork - XS1 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 21.3
Dbkf = 2.1
Abkf = 44
105
100
95
90
Elevation (ft)
0
10
20
30
40
Horizontal Distance (ft)


Meadow Fork – Reference Reach


Meadow Fork – Reference Reach


Meadow Fork – Reference Reach


Meadow Fork – Reference Reach


Meadow Fork – Reference Reach


Meadow Fork – Reference Reach

RIVERMORPH CROSS SECTION SUMMARY

River Name: Meadow Fork - Reference
Reach Name: Reach 1
Cross Section Name: XS1
Survey Date: 05/22/13

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	98.87	
3	0	98.77	
4.5	0	98.47	
5	0	98.1	BKF
5.3	0	97.76	
6.8	0	96.7	
7.1	0	96.07	
8.2	0	95.65	
8.2	0	95.64	
10.1	0	95.62	
11.5	0	95.41	
13.1	0	95.03	
15.4	0	95.02	
17.4	0	95.03	
19.3	0	95.16	
19.9	0	95.99	
20.4	0	96.24	
21	0	96.81	
22.3	0	97	
23.4	0	97.39	
25.1	0	97.33	
26.2	0	97.88	
27	0	99.31	
27.6	0	99.4	
28.2	0	99.52	
29	0	99.6	
31	0	99.69	

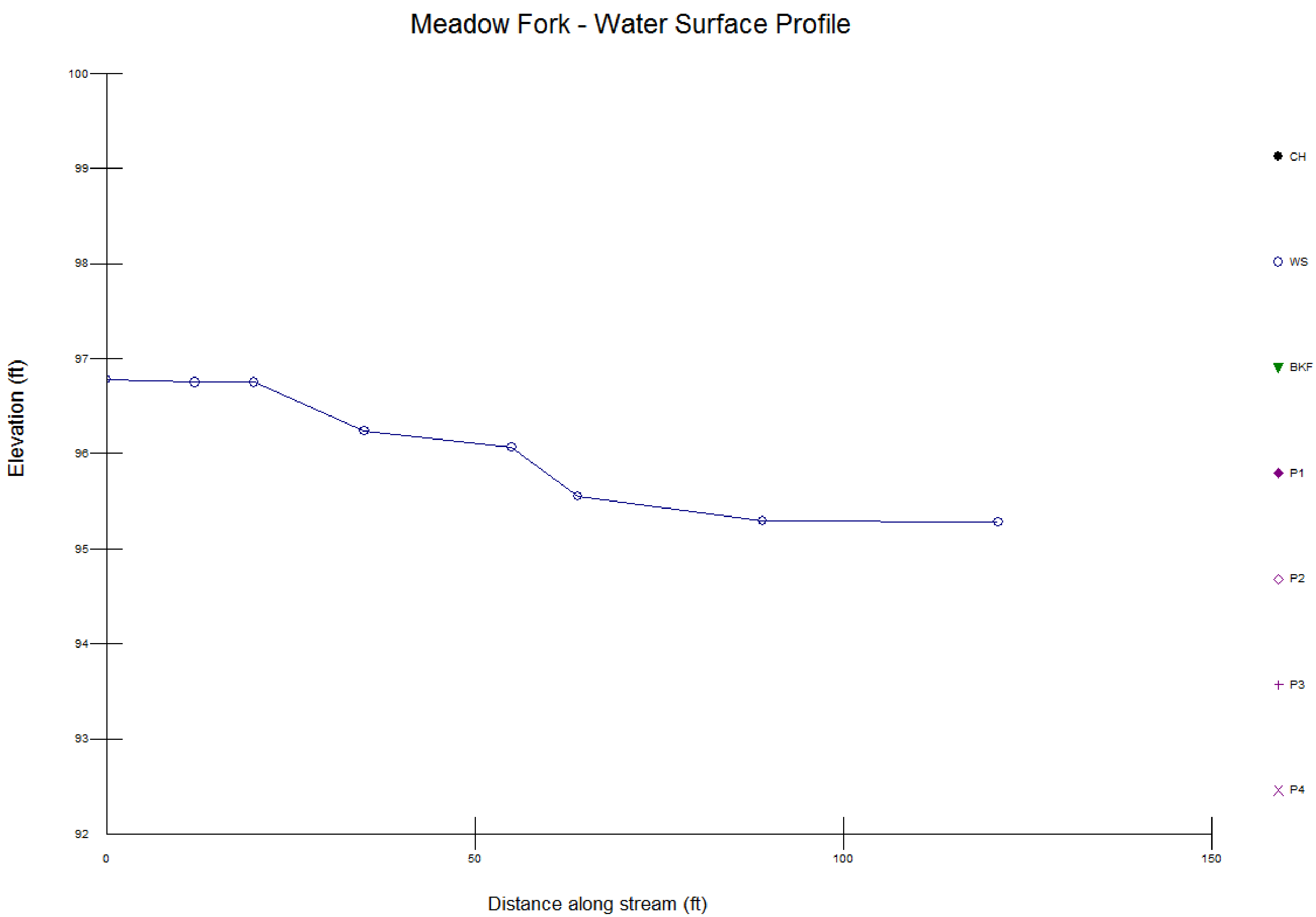
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	101.18	101.18	101.18
Bankfull Elevation (ft)	98.1	98.1	98.1
Floodprone Width (ft)	31	-----	-----
Bankfull Width (ft)	21.32	10.66	10.66
Entrenchment Ratio	1.45	-----	-----
Mean Depth (ft)	2.06	2.36	1.77
Maximum Depth (ft)	3.08	3.08	3.08
Width/Depth Ratio	10.33	4.52	6.02
Bankfull Area (sq ft)	44	25.13	18.88
Wetted Perimeter (ft)	23.41	14.77	14.8
Hydraulic Radius (ft)	1.88	1.7	1.28
Begin BKF Station	5	5	15.66
End BKF Station	26.32	15.66	26.32

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			



Meadow Fork - Water Surface Profile
Elevation (ft)
Distance along stream (ft)
100
99
98
97
96
95
94
93
92
0
50
100
150
CH
WS
BKF
P1
P2
P3
P4

APPENDIX 7. Floodplain Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. State NFIP Engineer), NC Floodplain Mapping Unit (attn. State NFIP Coordinator) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Little Pine Creek III Stream & Wetland Restoration Project
Name if stream or feature:	Little Pine Creek
County:	Alleghany County, NC
Name of river basin:	New River Basin
Is project urban or rural?	Rural
Name of Jurisdictional municipality/county:	Alleghany County, NC
DFIRM panel number for entire site:	Community: Alleghany County Community No. 370004 FIRM Panel: 4010J Map Number: 3711401000J Effective Date: September 2, 2009
Consultant name:	Wildlands Engineering, Inc. Emily Reinicker, PE, CFM
Phone number:	704-332-7754
Address:	1430 South Mint Street, Suite 104 Charlotte, NC 28203

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500".

Wildlands Engineering (Wildlands) is completing a design-bid-build project for the North Carolina Ecosystem Enhancement Program (EEP) to restore, enhance, and preserve a total of 15,207 existing linear feet (LF) of perennial and intermittent stream in Alleghany County, NC. The proposed total stream length located within conservation easement boundaries is 13,941 LF. The streams proposed for restoration, enhancement, and preservation include Little Pine Creek, a fourth order stream, as well as an unnamed third order tributary to Little Pine Creek (UT2), an unnamed second order tributary to Little Pine Creek (UT2A) and four unnamed first order tributaries to Little Pine Creek (UT1, UT2B, UT3, and UT4). Enhancement is also proposed on 2.3 acres of existing wetlands. The project is being completed to provide stream and wetland mitigation units (SMUs and WMUs) in the New River Basin. Buffer restoration will also take place but is not intended for mitigation credit at this time.

Please see Figure 6, FEMA Flood Map and Figure 10, Concept Design.

Summarize stream reaches or wetland areas according to their restoration priority.

Reach	Restored Length	Priority
Little Pine: Reach 1	*1,336*	*One, Two (Restoration)*
Little Pine: Reach 2a	*1,021*	*One (Restoration)*
Little Pine: Reach 2b	*955*	*One (Restoration)*
UT1	*909*	*Enhancement II*
UT2	*4,422*	*One, Two, Four, Preservation (Enhancement I)*
UT2A – Upper	*512*	*Four (Enhancement I)*
UT2A – Middle	*2,075*	*Preservation*
UT2A – Lower	*592*	*Enhancement II*
UT2B – Upper	*300*	*Enhancement II*
UT2B – Lower	*241*	*Two (Restoration)*
UT3	*367*	*Preservation*
UT4	*1,211*	*Preservation*

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

Yes, a short length of Little Pine Creek upstream of Big Oak Road is located in the backwater SFHA of Brush Creek. The Unnamed Tributaries (UTs) do not have associated SFHA.

◉ Yes ○ No

If project is located in a SFHA, check how it was determined:

☐ Redelineation

☑ Detailed Study

☐ Limited Detail Study

☐ Approximate Study

☐ Don't know

List flood zone designation: AE, X

Check if applies:

☑ AE Zone

- ○ Floodway
- ○ Non-Encroachment
- ◉ None

☐ A Zone

- ○ Local Setbacks Required
- ○ No Local Setbacks Required

If local setbacks are required, list how many feet: n/a

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

○ Yes ◉ No

Land Acquisition (Check)

☐ State owned (fee simple)

☑ Conservation easment (Design Bid Build)

☐ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

◉ Yes ○ No

Note: if community is not participating, then all requirements should be addressed to NFIP (attn: State NFIP Engineer, (919) 715-8000)

Name of Local Floodplain Administrator: Travis Dalton, Planner
Phone Number: 336-372-2942

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

☑ No Action

☐ No Rise

☐ Letter of Map Revision

☐ Conditional Letter of Map Revision

☐ Other Requirements

List other requirements:

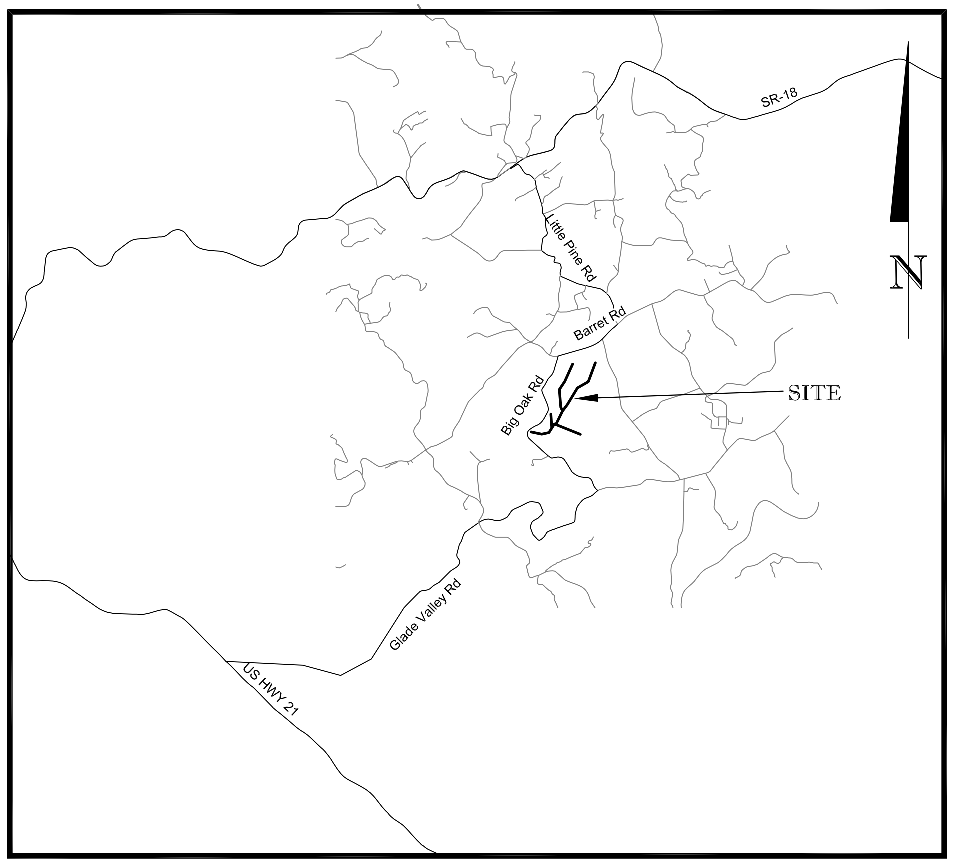
Comments:
Little Pine Creek is not a detailed study stream but is a tributary to Brush Creek, which is a detailed study stream. All of our work will be on Little Pine Creek upstream of Big Oak Road, a portion of which is within the flooding effects from Brush Creek. Wildlands discussed the project with Steve Garrett, CFM from the North Carolina Division of Emergency Management and Travis Dalton, the Alleghany County Local Floodplain Administrator. Both confirmed that the proposed work will not require a no-rise or a map revision. A summary notification letter will be sent to the Alleghany County Local Floodplain Administrator during the permitting phase.

Name: Emily G. Reinicker, PE, CFM Signature: [signature]

Title: Senior Water Resources Engineer Date: 5/21/2013

Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina
for
North Carolina Ecosystem Enhancement Program
EEP Id No: 94903
SCO Project No: 07-07088-03



Vicinity Map
Not to Scale

Ecosystem Enhancement Program

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N.C. ONE-CALL CENTER
IT'S THE LAW!

PRELIMINARY PLANS
ISSUED OCTOBER 9, 2013

Sheet Index

Project Directory

Surveying:
Kee Mapping and Surveying
111 Central Avenue
Asheville, NC 28801
Brad Kee, PLS
828-645-8275

Engineering:
Wildlands Engineering, Inc
License No. F-0831
1430 South Mint Street
Suite 104
Charlotte, NC 28203
Emily G. Reinicker, PE
704-332-7754

Owner:
North Carolina Ecosystem Enhancement Program
5 Ravenscroft Dr, Suite 102
Asheville, NC 28801
EEP Project Manager:
Harry Tsomides
828-545-7057

Disturbed Area:
31 Acres

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1430 S. Mint Street, Ste 104
Charlotte, NC 28203
Tel: 704.332.7754
Fax: 704.332.3306
Firm License No. F-0831

PRELIMINARY DO NOT USE FOR CONSTRUCTION

Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Title Sheet

Revisions:

Date:	October 9, 2013
Job Number:	005-02123
Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.:	07-07088-03

0.1
Sheet

PROJECT NOTES:

Topographic survey was performed by Kee Mapping and Survey on June 11, 2012. Additional survey completed February 22, 2013. Datum is NAD 83/NSR2007 & NAVD 1988.

Existing Property Line
Existing Thalweg
Existing Irrigation Line
Existing Major Contour (5' Interval)
Existing Minor Contour
Existing Overhead Electric
Existing Power Pole
Existing Easement
Existing Fence
Existing Tree
Existing Wetlands
Existing Farm Road
Existing Rock

Conservation Easement
Proposed Thalweg Alignment
Proposed Bankfull
Proposed Major Contour (5' Interval)
Proposed Minor Contour
Proposed Silt Fence
Proposed Safety Fence
Proposed Limits of Disturbance
Proposed Farm Road Relocation

Proposed Constructed Riffle
Varies per details on Sheets 5.1.
Coordinate with designer in the field.

Proposed Rock and Roll Riffle
See Detail 1, Sheet 5.2

Proposed Log Sill
See Detail 2, Sheet 5.2

Proposed Boulder Sill
See Detail 3, Sheet 5.4

Proposed Log J-Hook
See Detail 4, Sheet 5.2

Proposed Log Vane
See Detail 3, Sheet 5.2

Proposed Rock Vane
See Detail 2, Sheet 5.3

Proposed Rock "A" Vane
See Detail 1, Sheet 5.4

Proposed Rock Cross Vane
See Detail 2, Sheet 5.4

Proposed Rock J-Hook
See Detail 4, Sheet 5.4

Proposed Permanent Ford Crossing
See Detail 1, Sheet 5.7

Proposed Permanent Culvert Crossing
See Detail 3, Sheet 5.7

Proposed Brush Toe
See Detail 1, Sheet 5.5

Vernal Pool

1/5.1	CR-CR	Constructed Riffle
2/5.1	CR-WR	Woody Riffle
3/5.1	CR-JR	Jazz Riffle
4/5.1	CR-CH	Chunky Riffle
1/5.2	CH-RR	Rock and Roll Riffle

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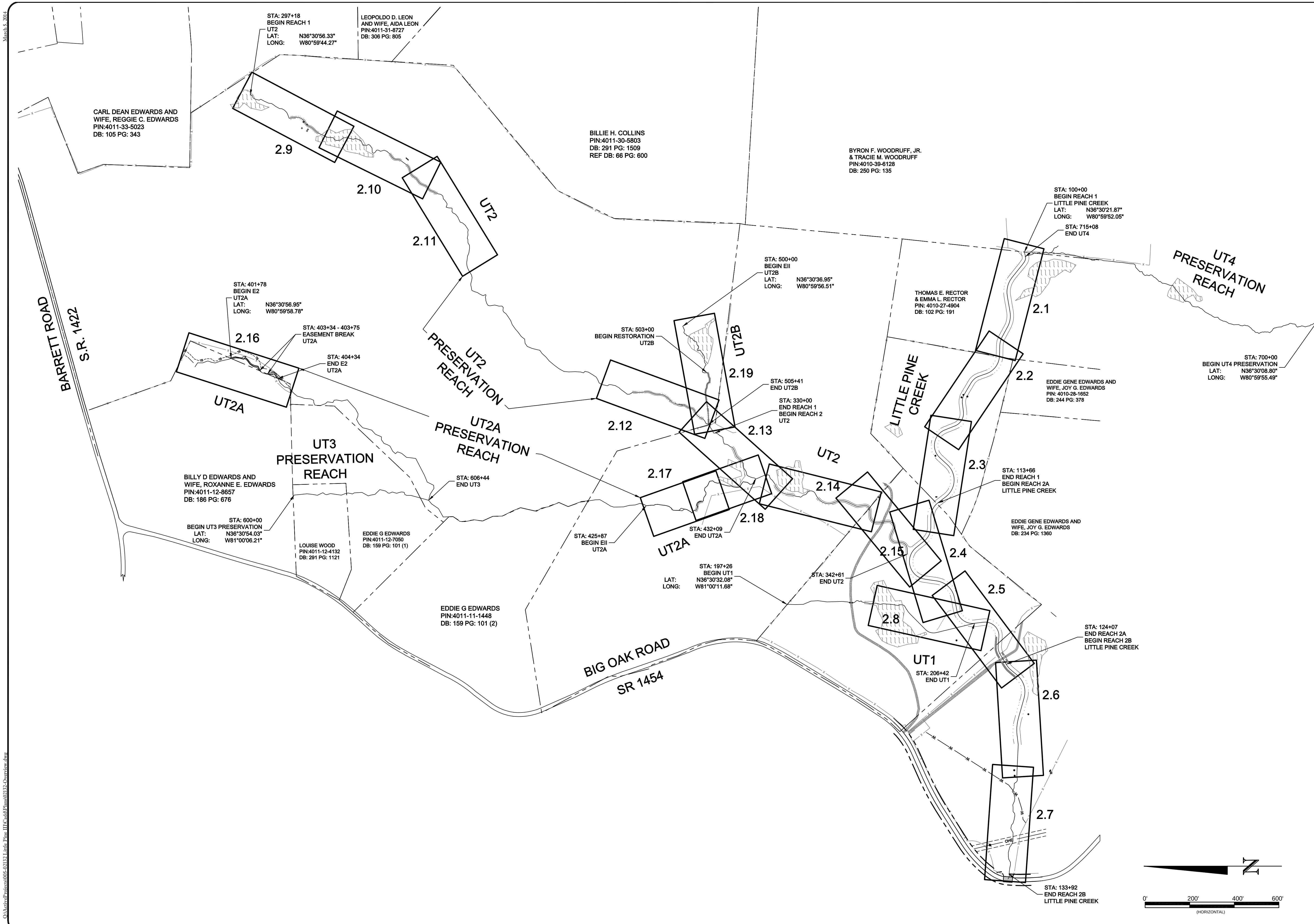
Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina
General Notes, Symbols, and Structure Table

Revisions:

Date: October 9, 2013
Job Number: 005-02123
Designed By: CMB
Drawn By: JCK
Checked By: EGR
SCO Project No.: 07-07088-03

Sheet 0.2



March 5, 2014

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Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Project Overview

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Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.: 07-07088-03	

0.3

Sheet

March 5, 2014

Structure Table - Little Pine Creek Reach 1									
Station Start	Station End	Elevation	Structure	Constructed Invert	Bank Elevation	Vane Arm Length	Bank Length	Slope %	Angle
100+00	100+21	-	CR-CR						
100+21	-	2534.60	Rock J-Hook						
100+46	101+35	-	CR-WR						
101+50	102+52	-	Brush Toe						
102+23	102+95	-	CR-JR						
103+04	103+75	-	Brush Toe						
104+58	105+03	-	CR-CH						
105+03	-	2532.13	Rock J-Hook						
105+75	106+20	-	Brush Toe						
106+09	106+44	-	CR-JR						
106+89	107+50	-	CR-CR						
107+95	108+31	-	CR-JR						
108+45	109+20	-	Brush Toe						
109+10	109+59	-	CR-CH						
109+59	-	2529.96	Rock J-Hook						
110+00	111+20	-	Brush Toe						
111+10	111+56	-	CR-WR						
111+56	-	2529.07	Rock J-Hook						
111+90	113+30	-	Brush Toe						
113+20	113+66	-	CR-JR						

Structure Table - Little Pine Creek Reach 2									
Station Start	Station End	Elevation	Structure	Constructed Invert	Bank Elevation	Vane Arm Length	Bank Length	Slope %	Angle
114+39	114+84	-	CR-CH						
115+00	115+60	-	Brush Toe						
115+56	116+25	-	CR-JR						
116+25	-	2525.97	Rock J-Hook						
116+60	118+00	-	Brush Toe						
117+88	118+43	-	CR-WR						
118+43	-	2524.63	Log Sill						
119+59	120+17	-	CR-CR						
120+17	120+80	-	Brush Toe						
121+26	121+65	-	CR-CH						
121+65	-	2522.37	Rock J-Hook						
122+00	122+75	-	Brush Toe						
122+75	123+16	-	CR-JR						
123+53	124+07	-	CR-CR						
124+41	124+77	-	CR-JR						
124+77	125+88	-	Brush Toe						
125+88	126+94	-	CR-RR						
127+48	127+96	-	CR-WR						
127+96	-	2516.9	Log Sill						
128+38	128+88	-	CR-CH						
128+88	-	2515.62	Log Sill						

Structure Table - UT1									
Station Start	Station End	Elevation	Structure	Constructed Invert	Bank Elevation	Vane Arm Length	Bank Length	Slope %	Angle
2002+32	-	2525.13	Rock A Vane						

Structure Table - UT2									
Station Start	Station End	Elevation	Structure	Constructed Invert	Bank Elevation	Vane Arm Length	Bank Length	Slope %	Angle
300+75	-	Grade	Log Sill						
300+90	-	Grade	Log Sill						
301+05	-	Grade	Log Sill						
302+45	-	2715.63	Log Sill						
302+52	-	2714.57	Log Sill						
302+58	-	2714.22	Log Sill						
302+65	302+70	-	CR-CH						
302+77	-	2713.47	Log Sill						
302+84	-	2712.97	Log Sill						
302+91	-	2712.47	Log Sill						
302+98	303+03	-	CR-CH						
303+10	-	2711.60	Log Sill						
303+17	-	2711.20	Log Sill						
303+25	303+31	-	CR-CH						
303+37	-	2710.30	Log Sill						
303+44	-	2709.80	Log Sill						
303+51	303+56	-	CR-CH						
303+51	-	2709.30	Log Sill						
303+62	-	2708.50	Log Sill						
303+69	-	2708.00	Log Sill						
308+12	-	2693.55	Log Sill						
308+20	-	2693.05	Log Sill						

Structure Table - UT2									
Station Start	Station End	Elevation	Structure	Constructed Invert	Grade Deviation	Vane Arm Length	Bank Tie in	Slope %	Angle
308+33	308+66	-	CR-CR						
308+66	308+90	-	Brush Toe						
308+90	309+07	-	CR-RR						
309+14	-	2689.00	Log J-Hook						
309+32	309+38	-	CR-CH						
309+38	-	2688.05	Log Sill						
309+53	309+65	-	CR-CH						
309+65	-	2686.80	Log Sill						
309+72	-	2686.30	Log Sill						
309+79	-	2685.90	Log Sill						
309+84	309+97	-	CR-CH						
309+97	-	2685.00	Log J-Hook						
310+13	310+20	-	CR-CH						
310+20	-	2684.10	Log Sill						
310+33	310+50	-	CR-CH						
325+75	325+89	-	CR-RR						
325+89	-	2580.46	Log Sill						
325+95	326+11	-	CR-CH						
326+11	-	2579.16	Log Sill						
326+18	-	2578.86	Log Sill						
326+24	326+34	-	CR-CH						
326+42	-	2578.01	Log Sill						
326+49	326+82	-	CR-CH						
326+92	-	2575.91	Log Sill						
327+02	327+13	-	CR-CH						
327+13	-	2574.81	Log Sill						
327+20	327+34	-	CR-CH						
327+34	-	2573.00	Log Sill						
327+42	327+58	-	CR-CH						
327+58	-	2572.30	Log Sill						
327+64	-	2571.90	Log Sill						
327+71	-	2571.40	Log Sill						
327+77	327+97	-	CR-CH						
327+97	-	2569.80	Log Sill						
328+11	328+23	-	CR-CH						
328+23	-	2569.20	Log Sill						
328+29	328+39	-	CR-CH						
328+46	-	2568.00	Log Sill						
328+52	328+65	-	CR-CH						
328+65	-	2566.80	Log Sill						
328+73	328+88	-	CR-RR						
328+88	-	2565.80	Log Sill						
328+97	329+02	-	CR-CH						
331+04	331+57	-	CR-CR						
333+60	-	Grade	Log Sill						
333+75	-	Grade	Log Sill						
334+14	334+29	-	CR-CH						
334+29	-	2546.40	Log Sill						
334+37	334+48	-	CR-CH						
334+54	334+79	-	CR-RR						
334+91	335+08	-	CR-CH						
335+08	-	2544.15	Log Sill						
336+30	336+55	-	CR-CH						
336+55	-	Grade	Log Sill						
336+77	337+00	-	CR-CH						
337+15	337+50	-	CR-CH						
337+50	-	2538.29	Log Sill						
337+66	337+83	-	CR-CH						
338+00	338+43	-	CR-CH						
338+43	-	2535.09	Log Sill						
338+56	338+82	-	CR-CH						
338+82	-	2533.79	Log Sill						
339+19	339+46	-	CR-CH						
339+46	-	2532.49	Log Sill						
340+01	340+39	-	CR-CH						
340+39	-	2530.89	Log Sill						
340+97	341+24	-	CR-CH						
341+24	-	2529.49	Log Sill						
341+71	341+93	-	CR-CH						
341+93	-	2528.19	Log Sill						
342+34	342+61	-	CR-RR						

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Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

Structure Tables

Revisions:

Date: October 9, 2013
Job Number: 005-02123
Designed By: CMB
Drawn By: JCK
Checked By: EGR
SCO Project No.: 07-07088-03

0.4

Sheet

Structure Table - UT2A									
Station Start	Station End	Elevation	Structure	Constructed Invert	Bank Elevation	Vane Arm Length	Bank Length	Slope %	Angle
401+82	-	Grade	Log Sill						
428+15	428+29	-	CR-CH						
428+29	-	2563.48	Log Sill						
428+35	428+40	-	CR-CH						
428+40	-	2562.90	Log Sill						
428+46	428+51	-	CR-CH						

Structure Table - UT2B									
Station Start	Station End	Elevation	Structure	Constructed Invert	Bank Elevation	Vane Arm Length	Bank Length	Slope %	Angle
503+01	-	2578.26	Log Sill						
503+06	-	2577.76	Log Sill						
503+11	503+20	-	CR-CH						
503+20	-	2576.80	Log Sill						
503+24	-	2576.50	Log Sill						
503+30	503+40	-	CR-CH						
503+40	-	2575.40	Log Sill						
503+44	-	2575.10	Log Sill						
503+49	-	2574.70	Log Sill						
503+54	503+64	-	CR-CH						
503+64	-	2573.60	Log Sill						
503+69	-	2573.10	Log Sill						
503+73	-	2572.80	Log Sill						
503+78	-	2572.30	Log Sill						
503+83	-	2572.00	Log Sill						
503+88	-	2571.60	Log Sill						
503+93	-	2571.10	Log Sill						
503+97	504+07	-	CR-CH						
504+14	504+23	-	CR-CH						
504+23	-	2569.50	Log Sill						
504+29	504+40	-	CR-CH						
504+51	-	2568.10	Log Sill						
504+56	-	2567.70	Log Sill						
504+61	-	2567.30	Log Sill						
504+66	504+77	-	CR-CH						
504+83	504+98	-	CR-CH						
504+98	-	2565.30	Log Sill						
505+03	505+15	-	CR-CH						
505+15	-	2564.40	Log Sill						
505+21	-	2564.10	Log Sill						
505+26	505+41	-	CR-CH						

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Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Structure Tables

Revisions:

Date: October 9, 2013
Job Number: 005-02123
Designed By: CMB
Drawn By: JCK
Checked By: EGR
SCO Project No. 07-07088-01

Sheet 0.5

March 5, 2014
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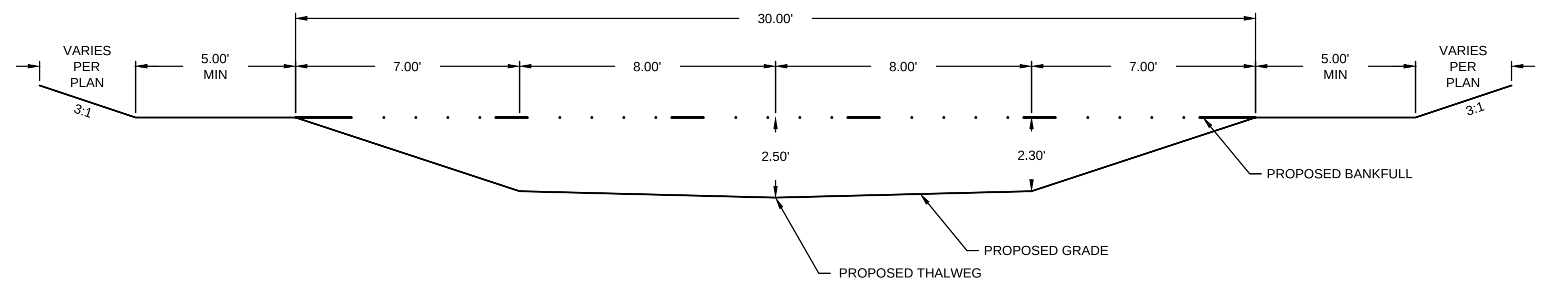
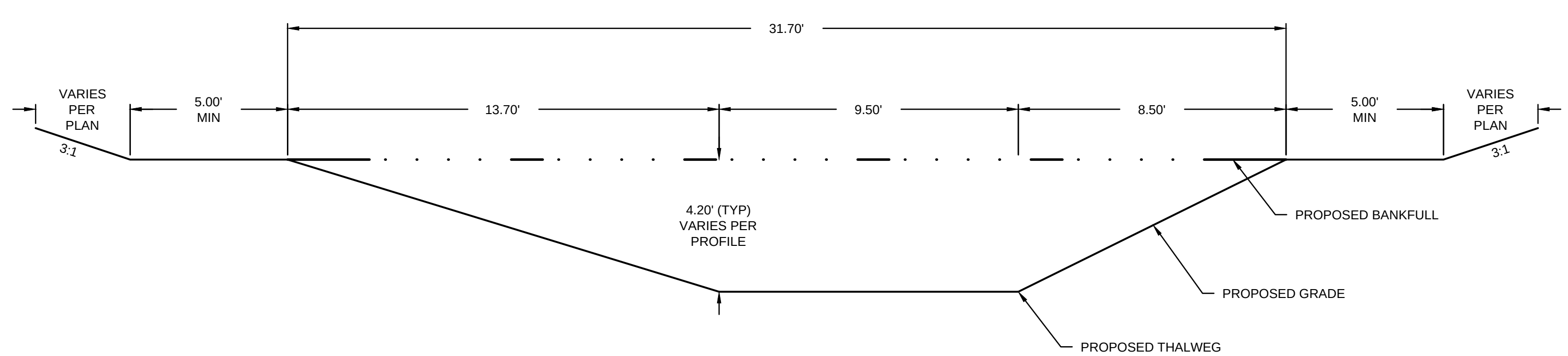


Little Pine Creek Reach 1 - Typical Section: Riffle
Sta:100+00 - 113+66
Not To Scale



Little Pine Creek Reach 1 - Typical Section: Pool
Sta:100+00 - 113+66
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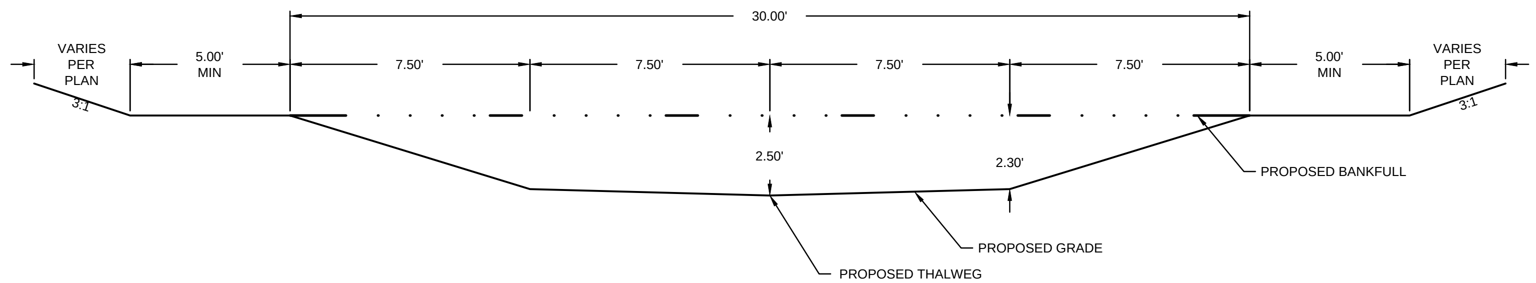
Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Typical Sections - Little Pine

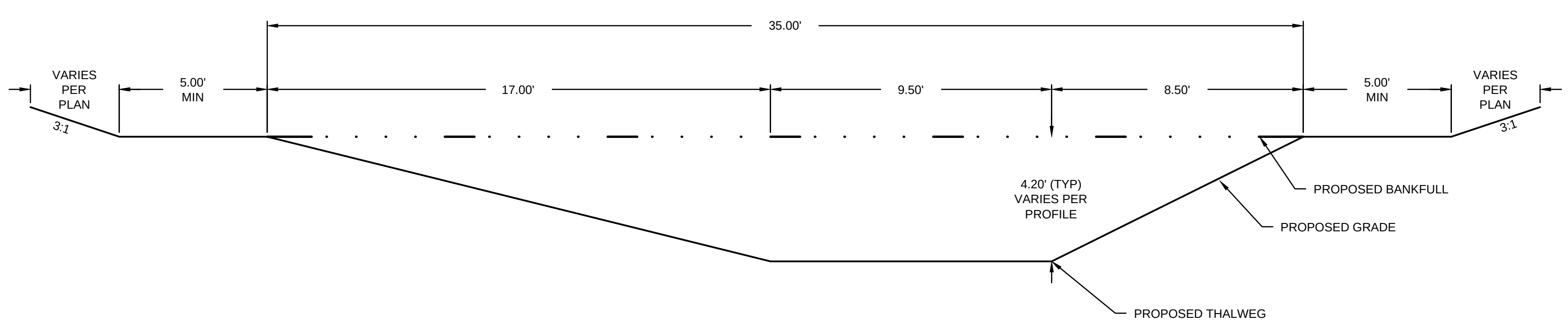
Revisions:

Date: October 9, 2013
Job Number: 005-02132
Designed By: CMH
Drawn By: JCK
Checked By: EGR
SCO Project No: 07-07088-03

Sheet 1.1



Little Pine Creek Reach 2A - Typical Section: Riffle
Sta: 113+66 to 124+07
Not To Scale



Little Pine Creek Reach 2A - Typical Section: Pool
Sta: 113+66 to 124+07
Not To Scale

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Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Typical Sections - Little Pine

Revisions:

Date:	October 9, 2013
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Designed By:	CMB
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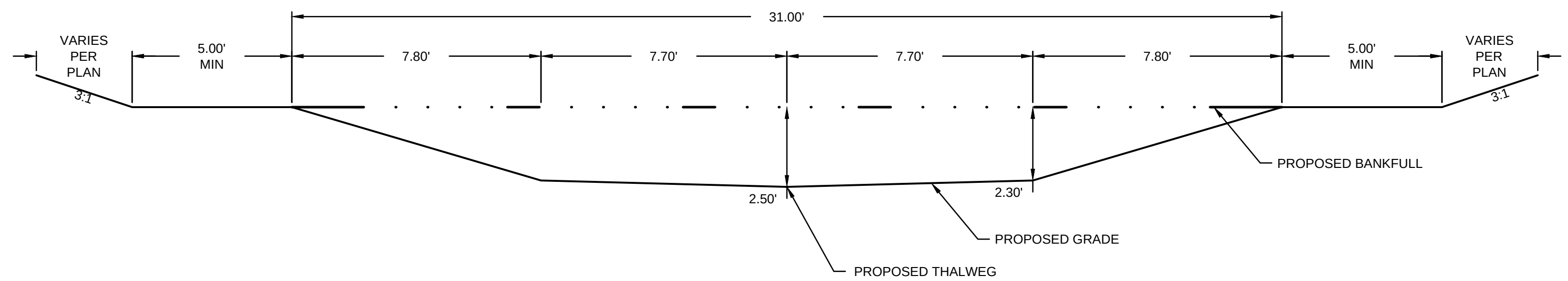
Checked By:	EGR
SCO Project No.: 07-07088-03	

Sheet 1.2



Little Pine Creek Reach 2B - Typical Section: Riffle

Sta: 124+07 to 134+05

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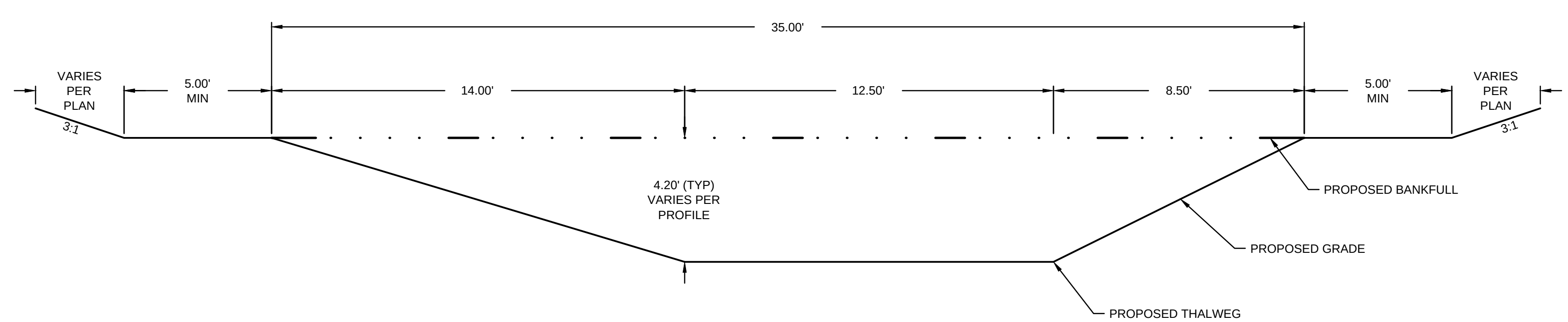

Little Pine Creek Reach 2B - Typical Section: Pool

Sta: 124+07 to 134+05

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Alleghany County, North Carolina

Typical Sections - Little Pine

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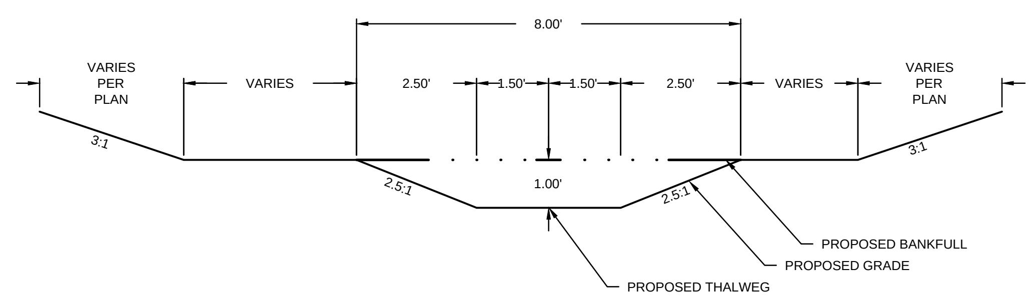

UT1 Reach 1 - Typical Section: Riffle

Sta: 202+32 to 206+42

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Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

Typical Sections - UT1

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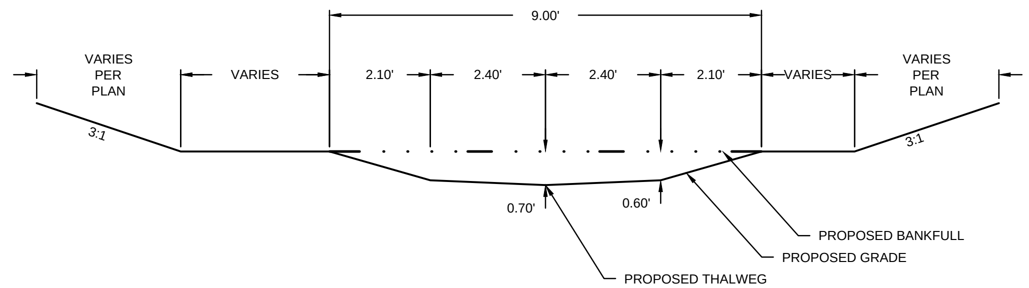
SCO Project No.:	07-07088-03

Sheet 1.4

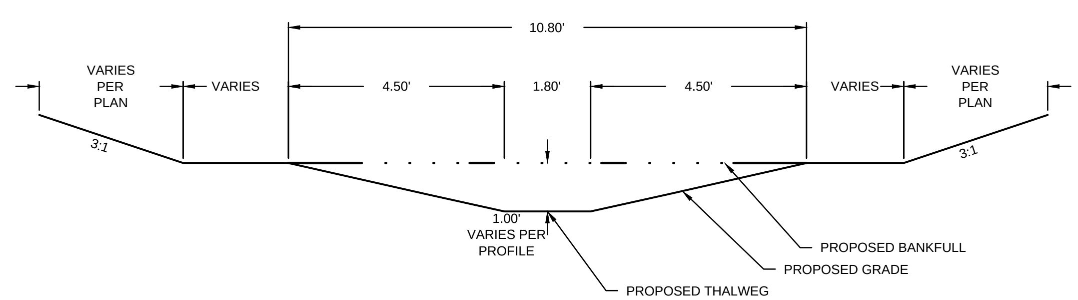
October 8, 2013



UT2 Reach 1 - Typical Section: Riffle

Sta: 300+00 - 330+00

Not To Scale



UT2 Reach 1 - Typical Section: Pool

Sta:300+00 to 330+00

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PRELIMINARY DO NOT USE FOR CONSTRUCTION

Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

Typical Sections - UT2

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SCO Project No.:	07-07088-03

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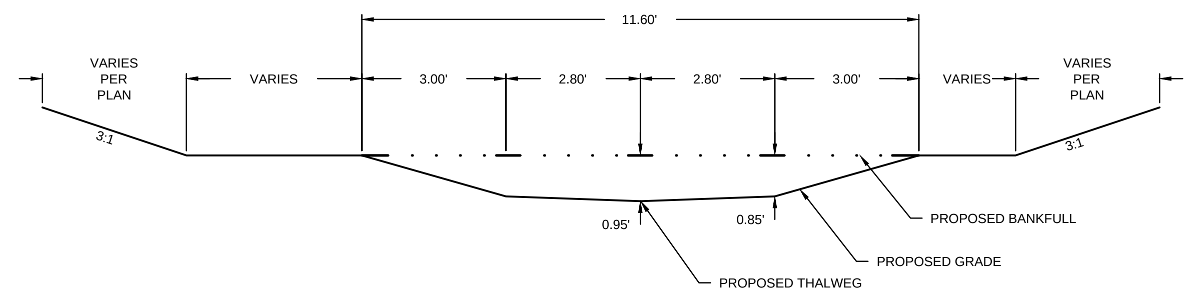
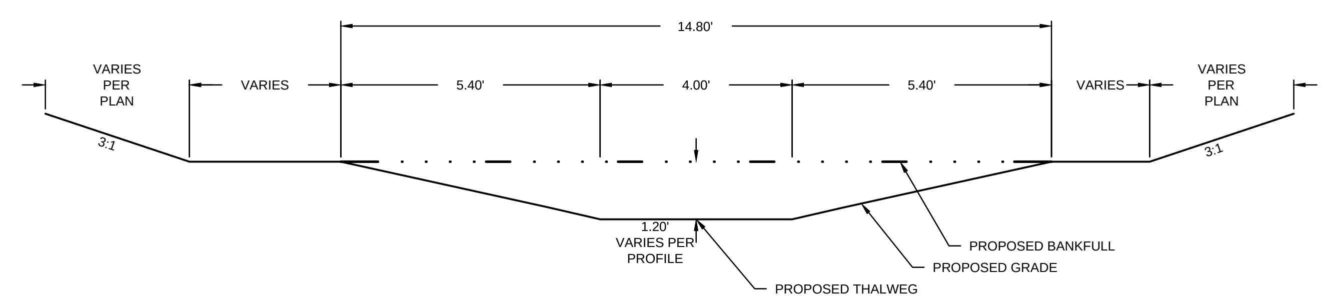
Sheet

October 8, 2013



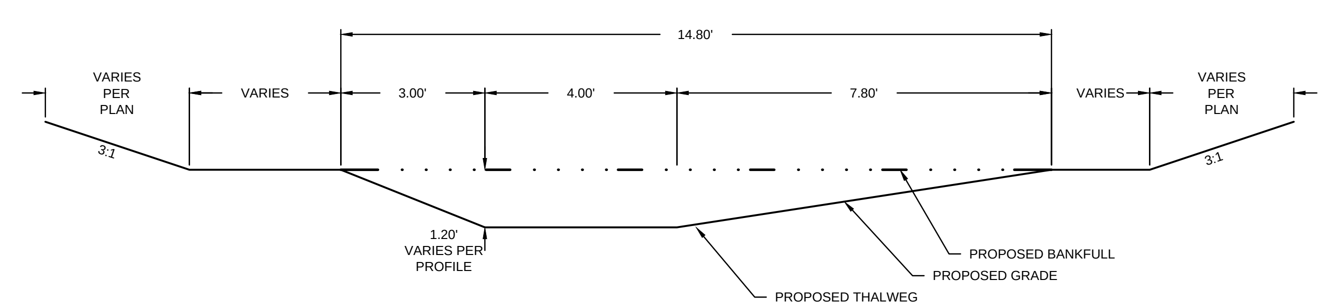
UT2 Reach 2 - Typical Section: Riffle

Sta: 330+00 - 342+61
Not To Scale



UT2 Reach 2 - Typical Section: In-Line Pool

Sta: 330+00 to 342+61
Not To Scale



UT2 Reach 2 - Typical Section: Meander Pool

Sta: 330+00 to 342+61
Not To Scale

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Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Typical Sections - UT2

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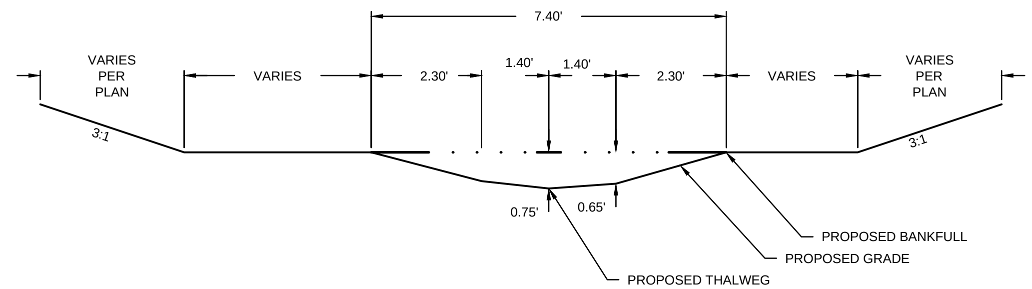
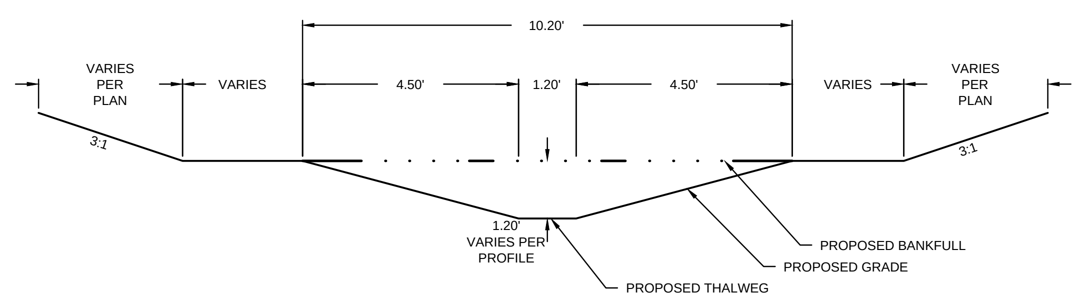


UT2A - Typical Section: Riffle

Sta: 425+58 to 432+09

Not To Scale



UT2A - Typical Section: Pool

Sta: 425+58 to 432+09

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Little Pine Creek III Stream & Wetland Restoration Project

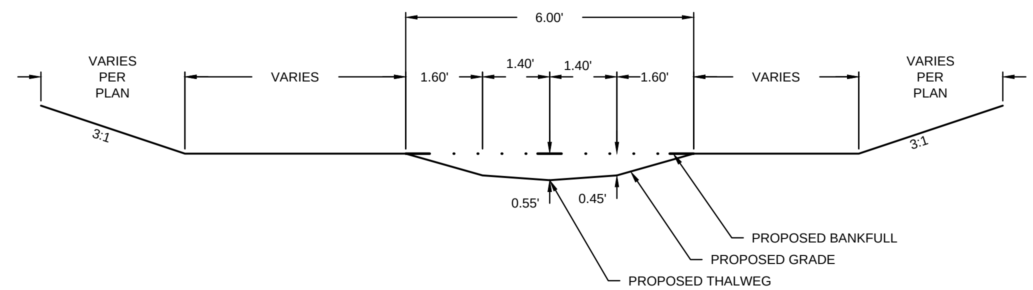
Alleghany County, North Carolina

Typical Sections - UT2A

Revisions:

Date:	October 9, 2013
Job Number:	005-02123
Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.:	07-07088-03

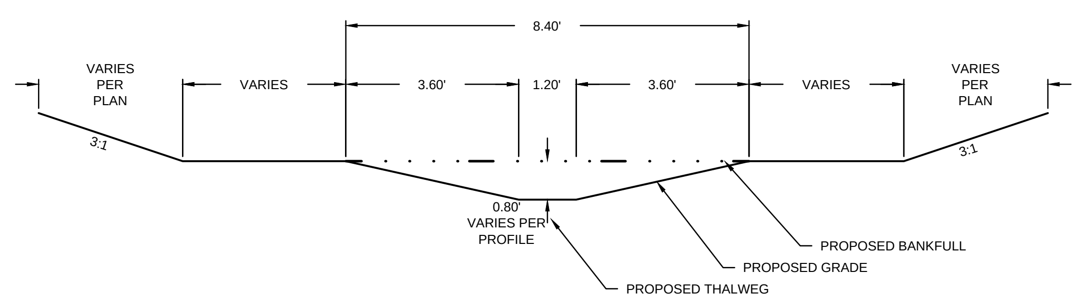
Sheet 1.7



UT2B - Typical Section: Riffle

Sta: 503+00 to 505+41

Not To Scale



UT2B - Typical Section: Pool

Sta: 503+00 to 505+41

Not To Scale

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Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

Typical Sections - UT2B

Revisions:

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Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.:	07-07088-03

Sheet 1.8

October 8, 2013

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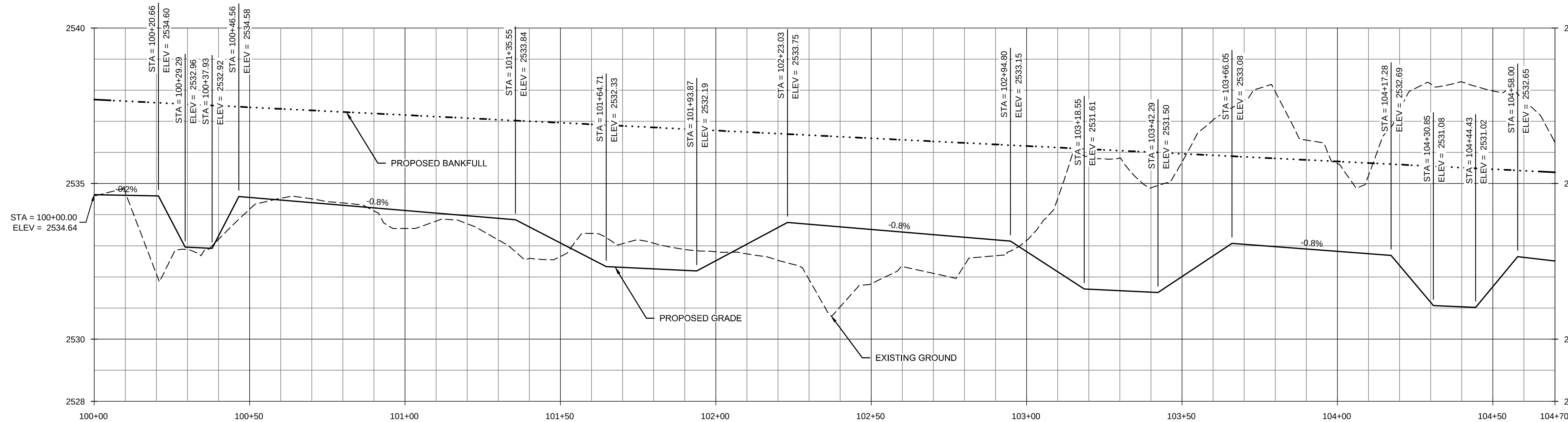

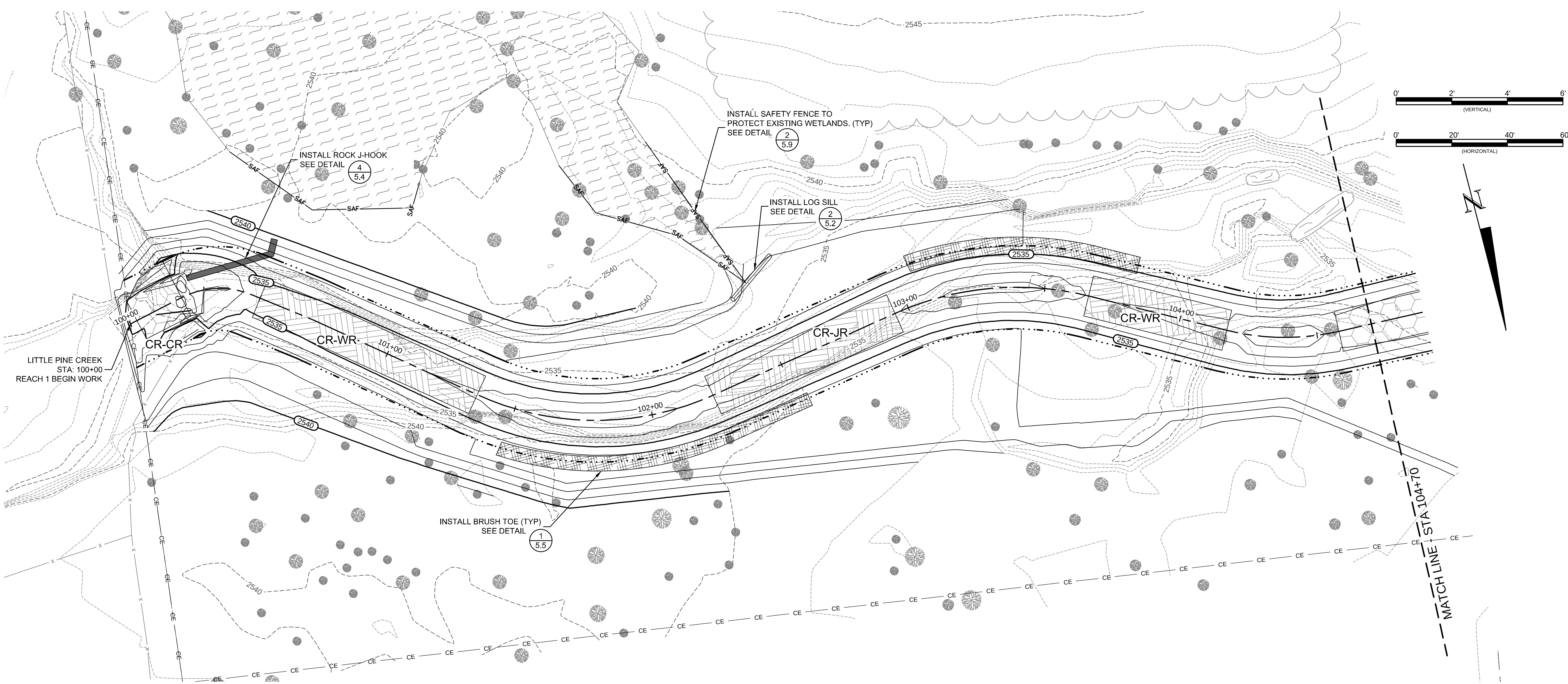

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Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

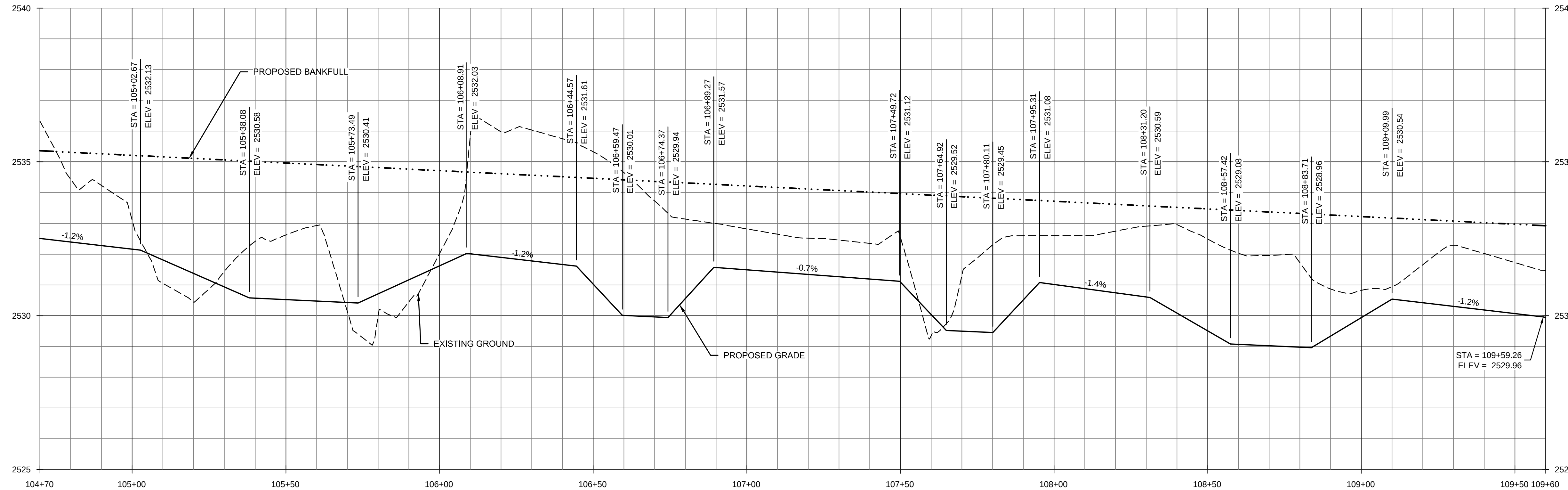
Little Pine Creek

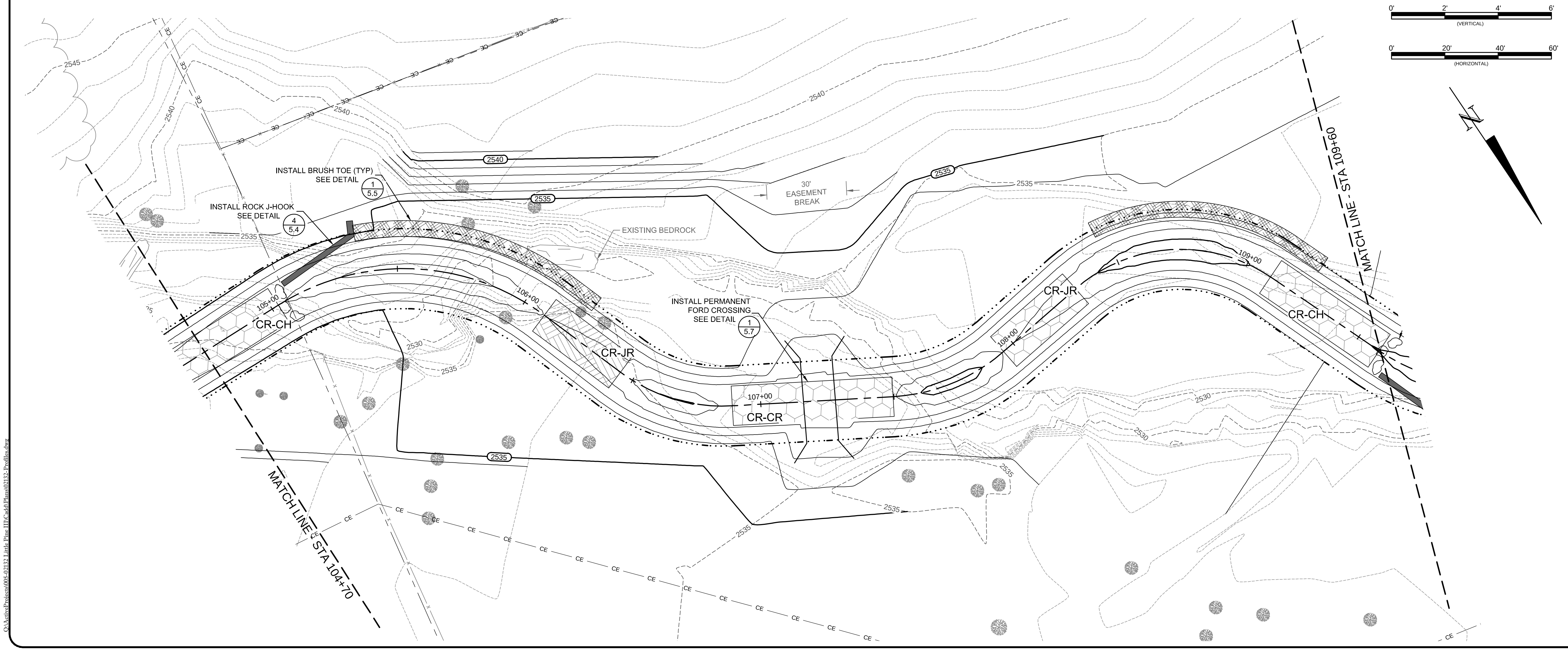
Stream Plan and Profile

Revisions:

Date:	October 9, 2013
Job Number:	005-02123
Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.: 07-07088-03	

Sheet 2.1





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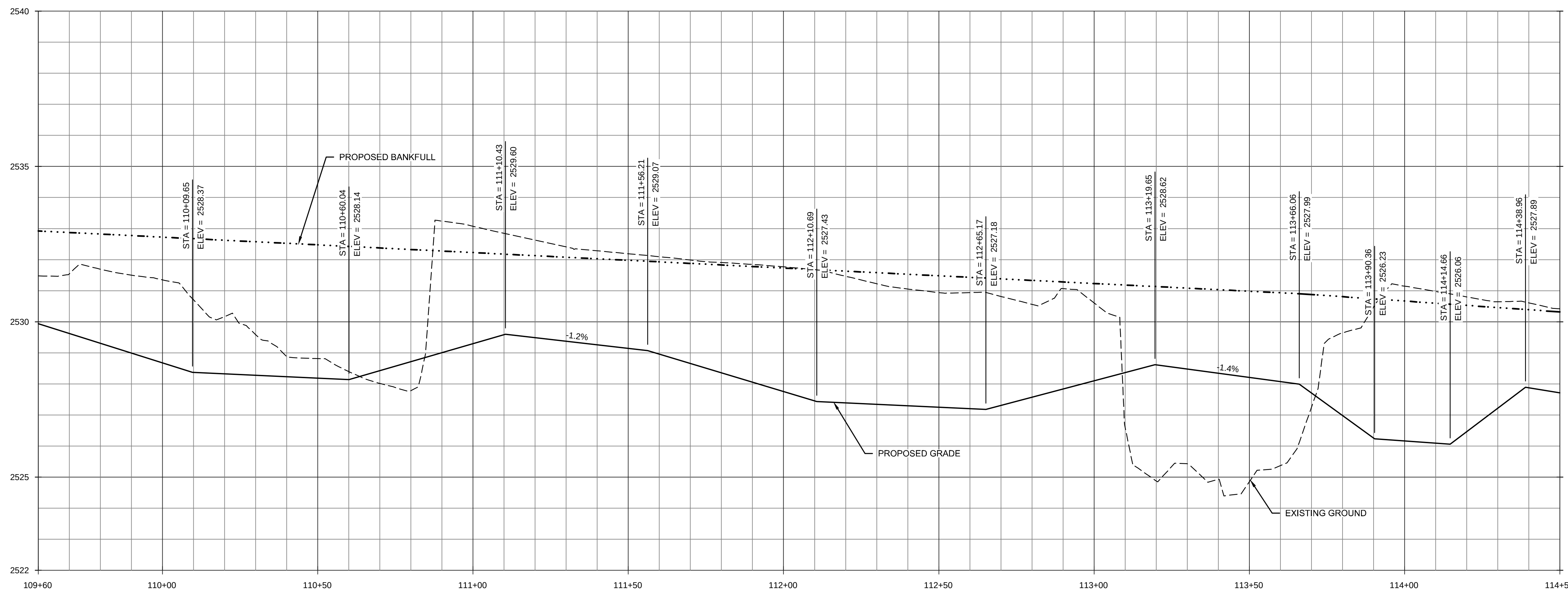
Alleghany County, North Carolina

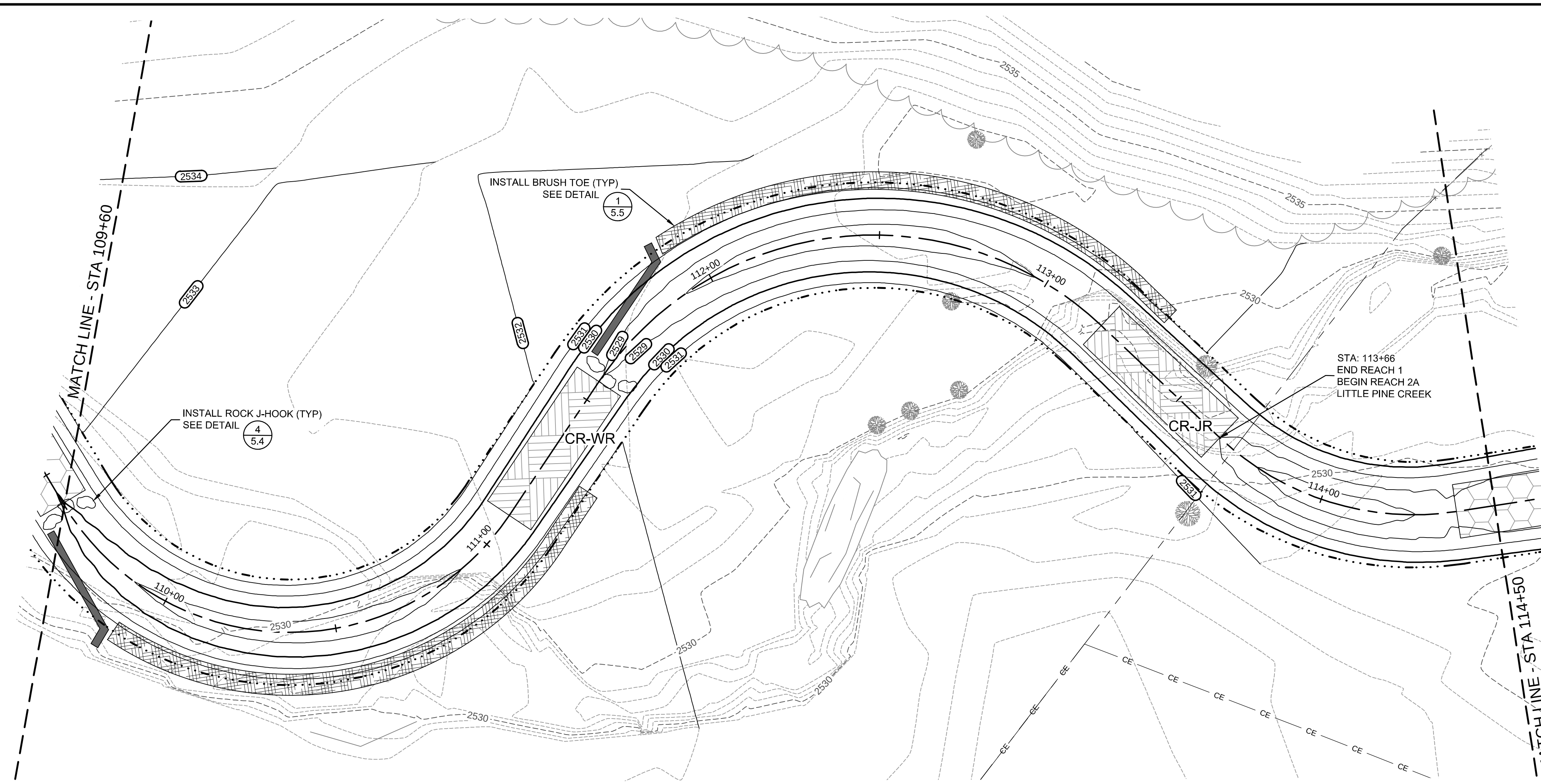
Little Pine Creek
Stream Plan and Profile

Revisions:

Date:	October 9, 2013
Job Number:	005-02132
Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.:	07-07088-03

Sheet 2.2





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Alleghany County, North Carolina

Little Pine Creek
Stream Plan and Profile

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Job Number:	005-02123
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Drawn By:	JCK
Checked By:	EGR
SCO Project No.: 07-07088-03	

2.3
Sheet

October 8, 2013

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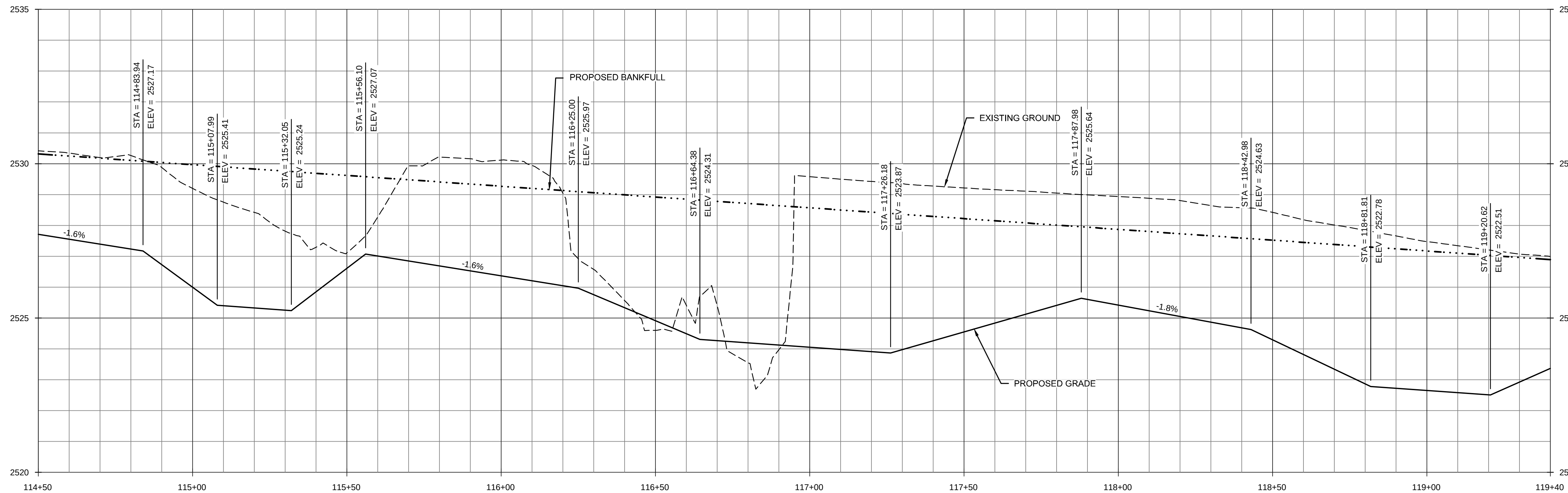

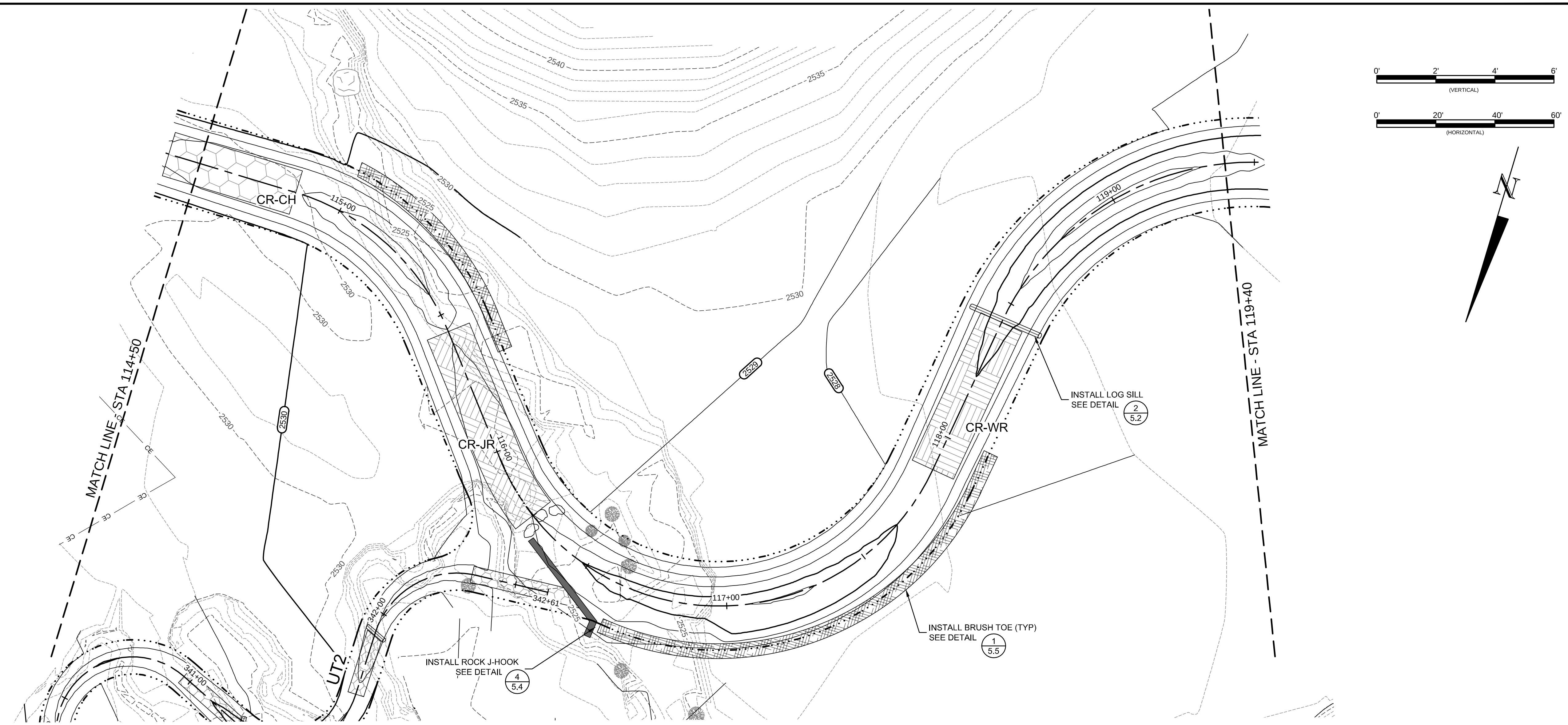

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Little Pine Creek
Stream Plan and Profile

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Drawn By: JCK
Checked By: EGR
SCO Project No.: 07-07088-03

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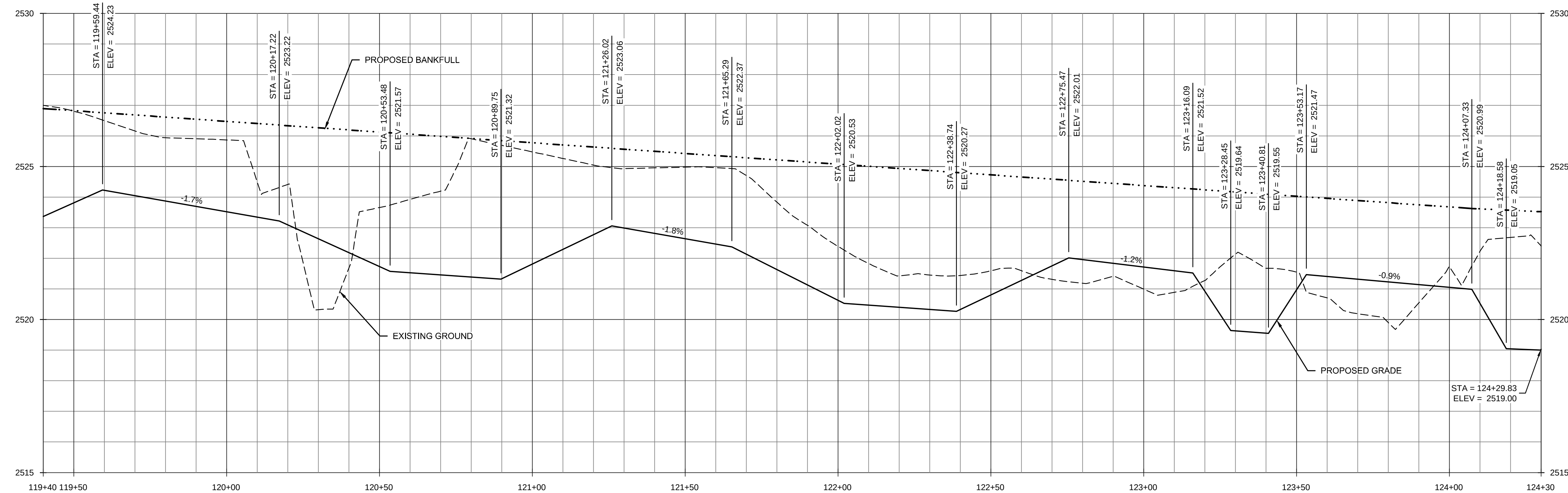

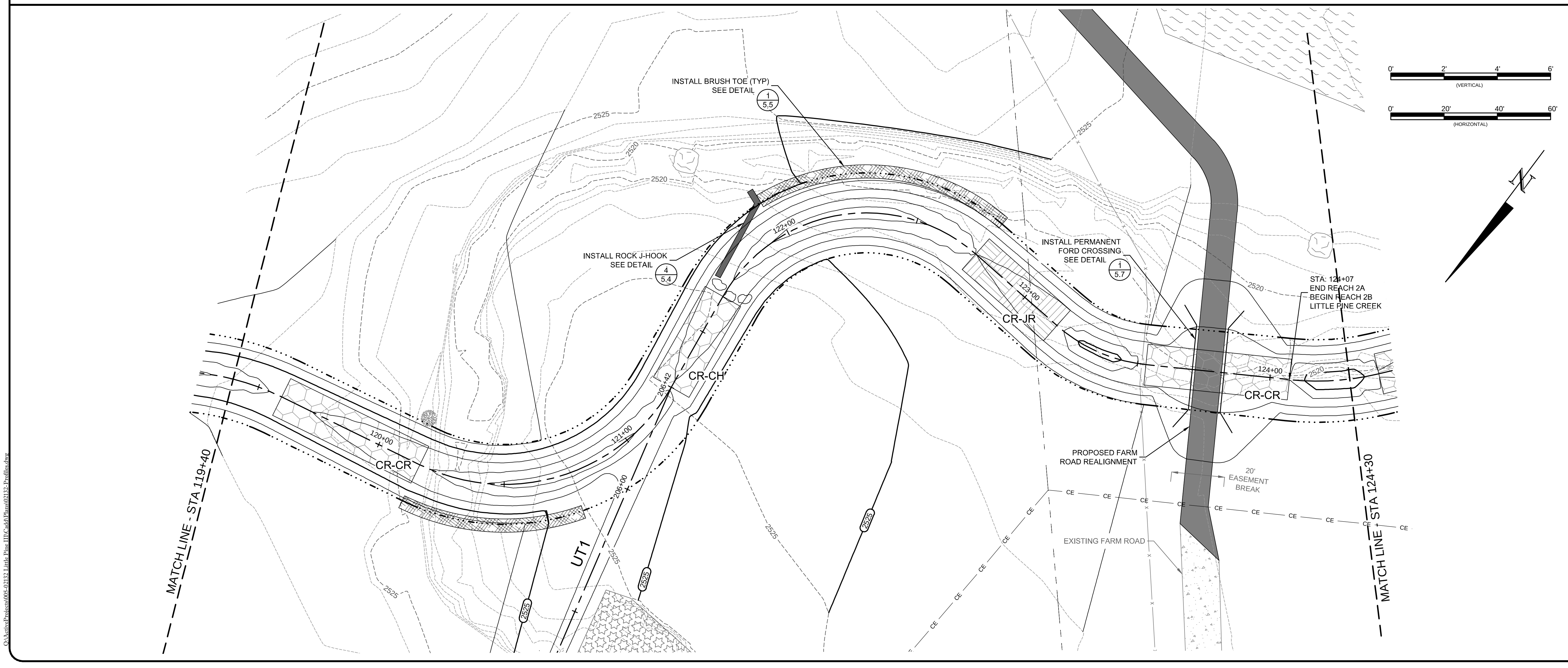

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Alleghany County, North Carolina

Little Pine Creek
Stream Plan and Profile

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Drawn By: JCK
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SCO Project No: 07-07088-03

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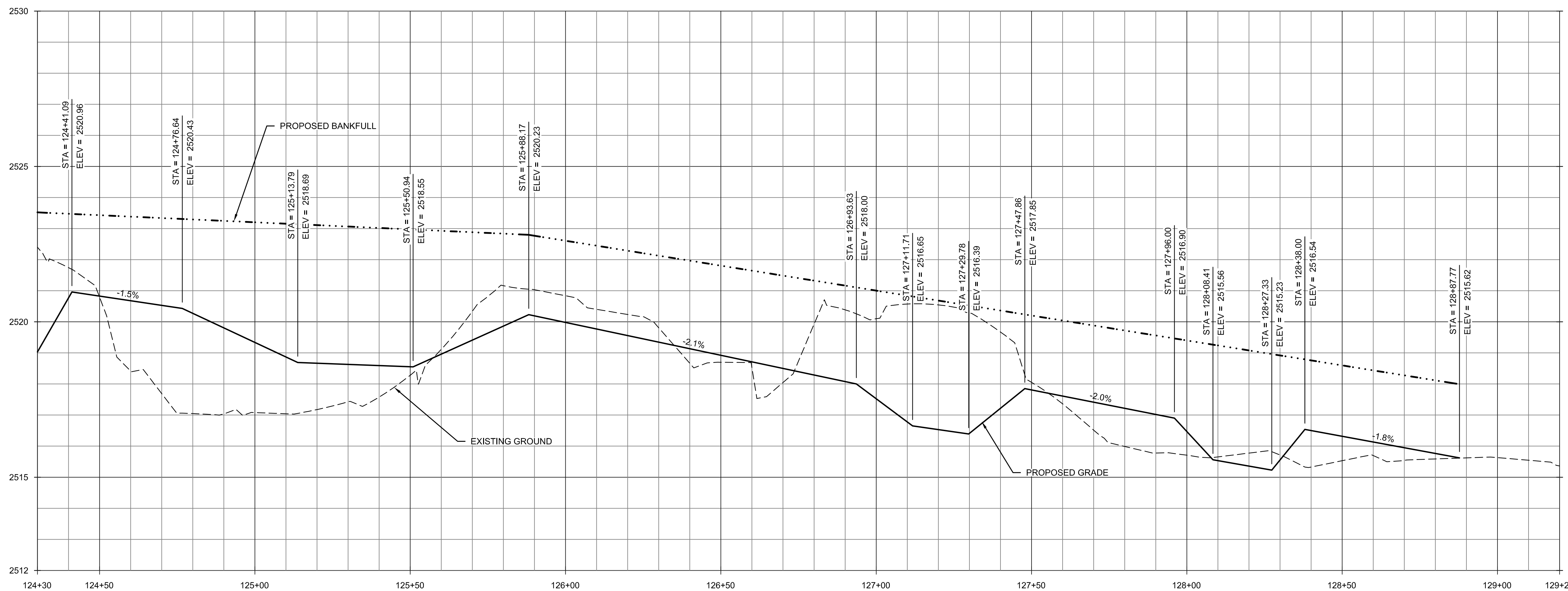
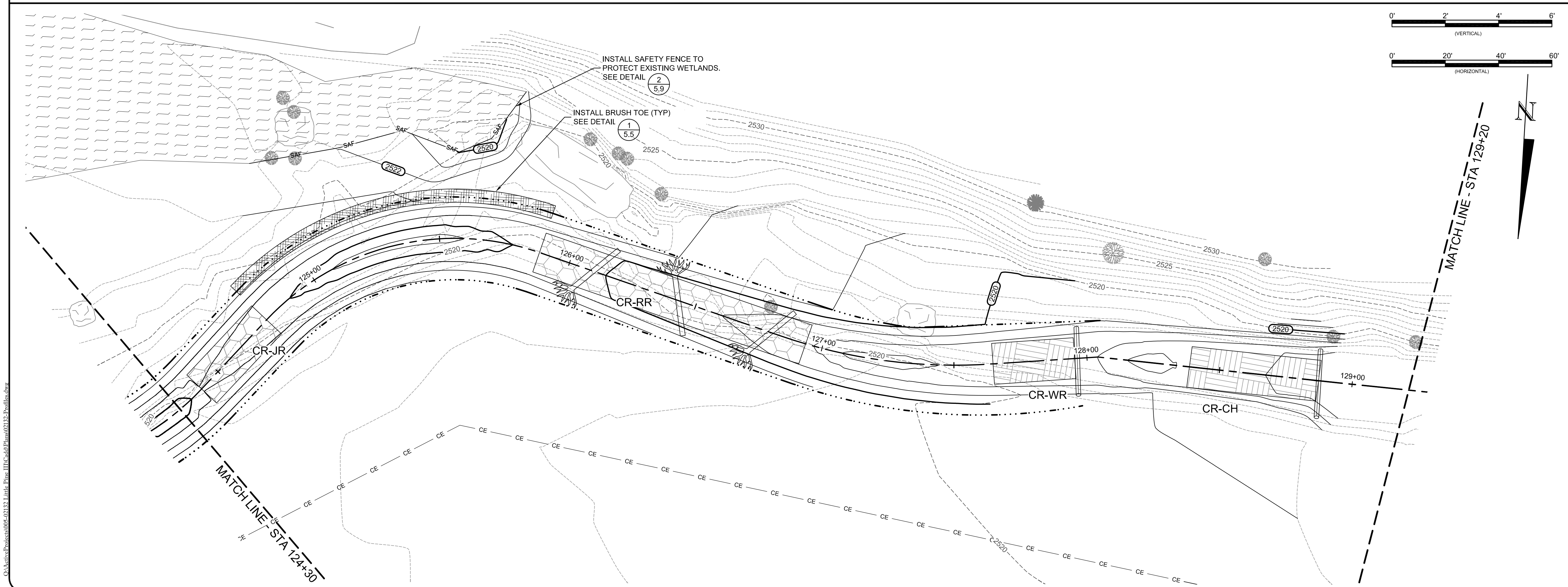
October 8, 2013





Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

Little Pine Creek
Stream Plan and Profile

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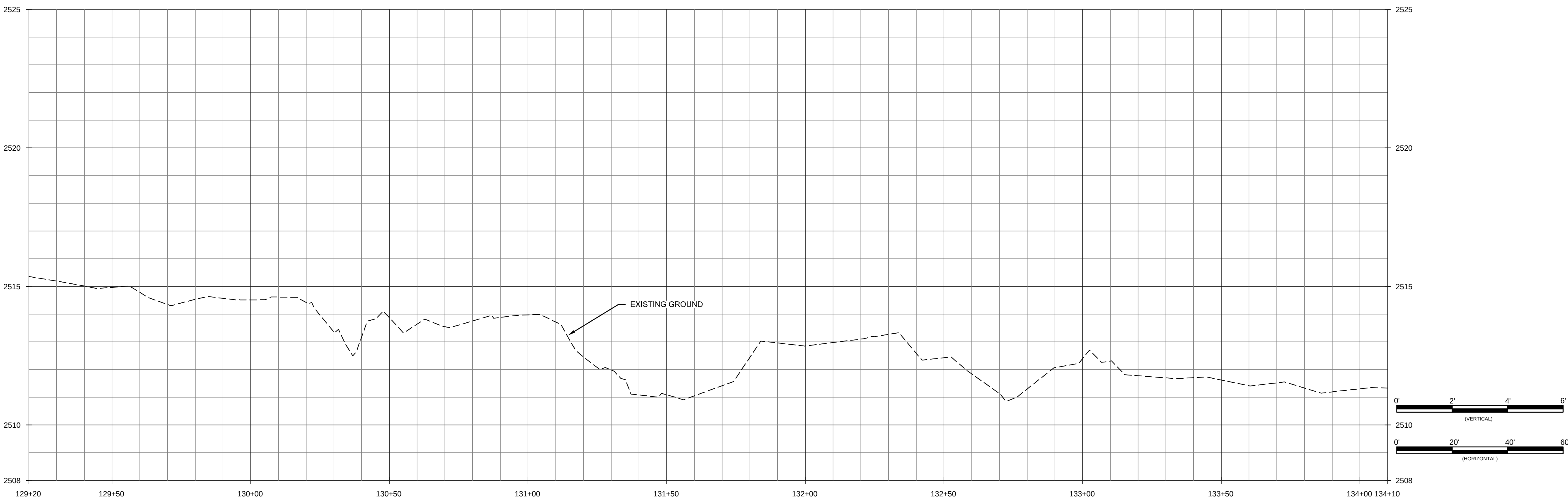

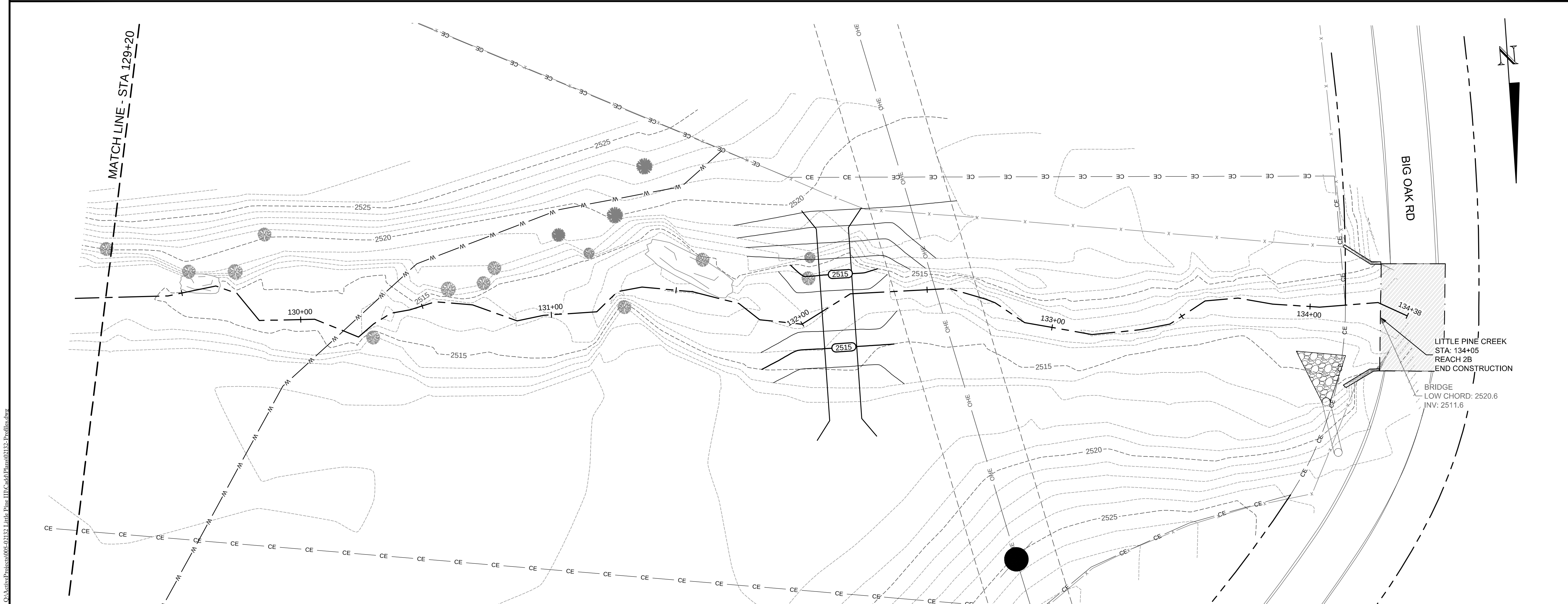

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Little Pine Creek
Stream Plan and Profile

Revisions:

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SCO Project No.:	07-07088-03

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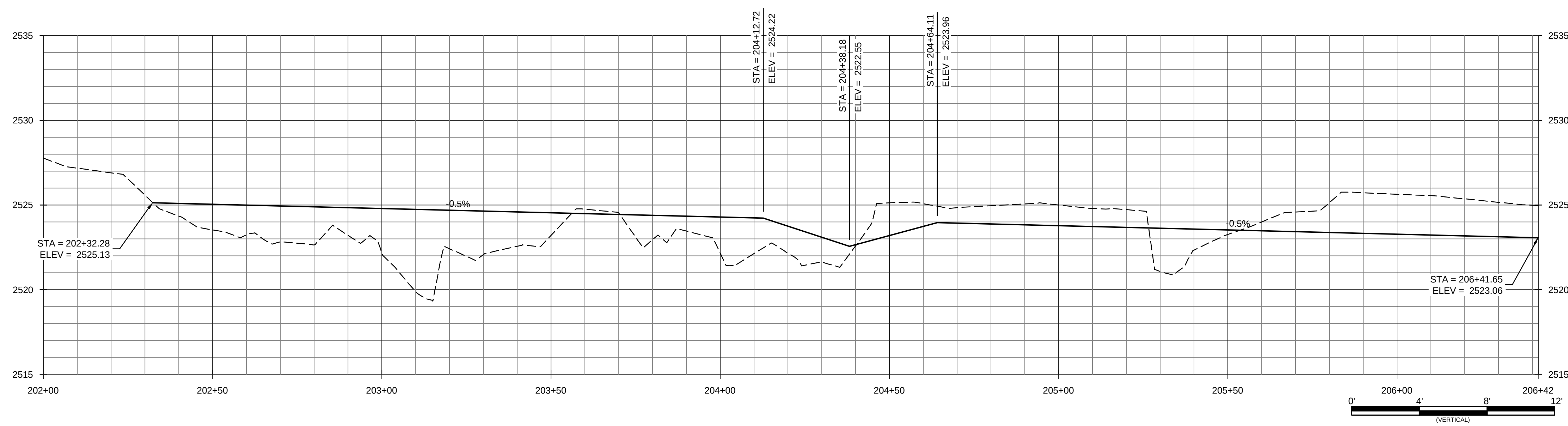

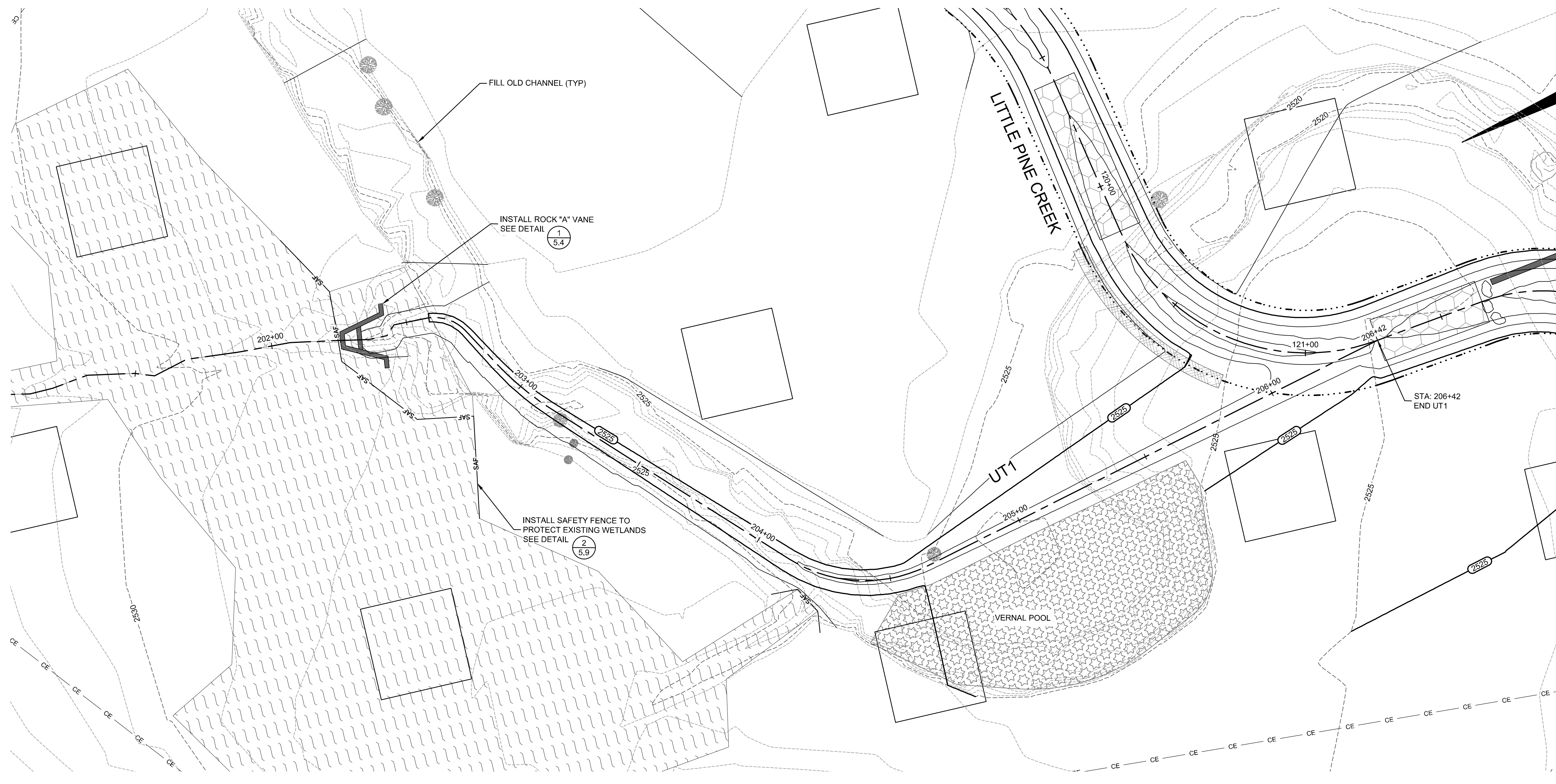

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UT1
Stream Plan and Profile

Revisions:

Date:	October 9, 2013
Job Number:	005-02132
Designed By:	CMR
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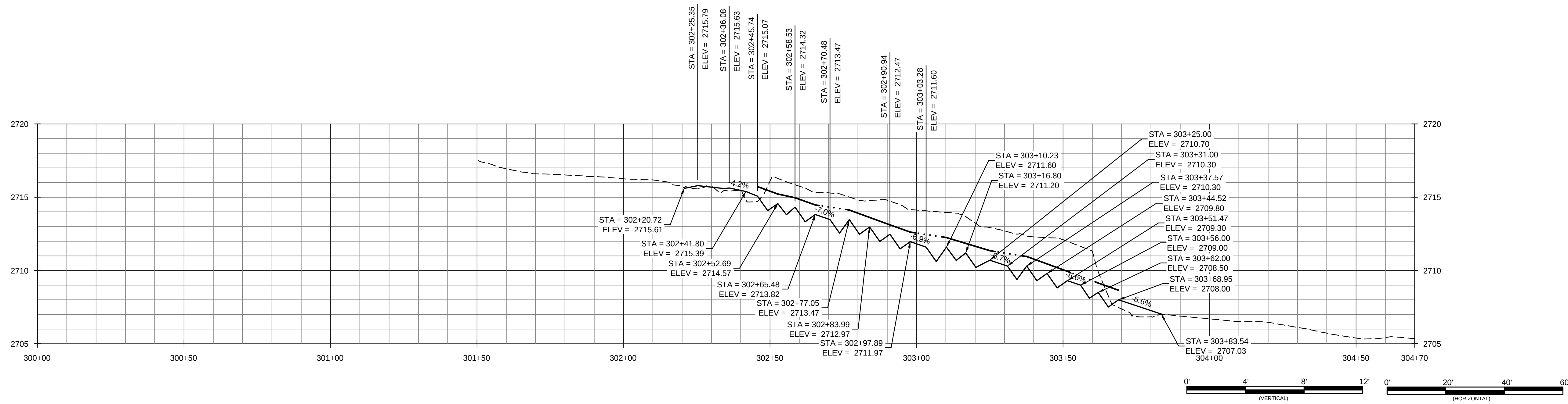

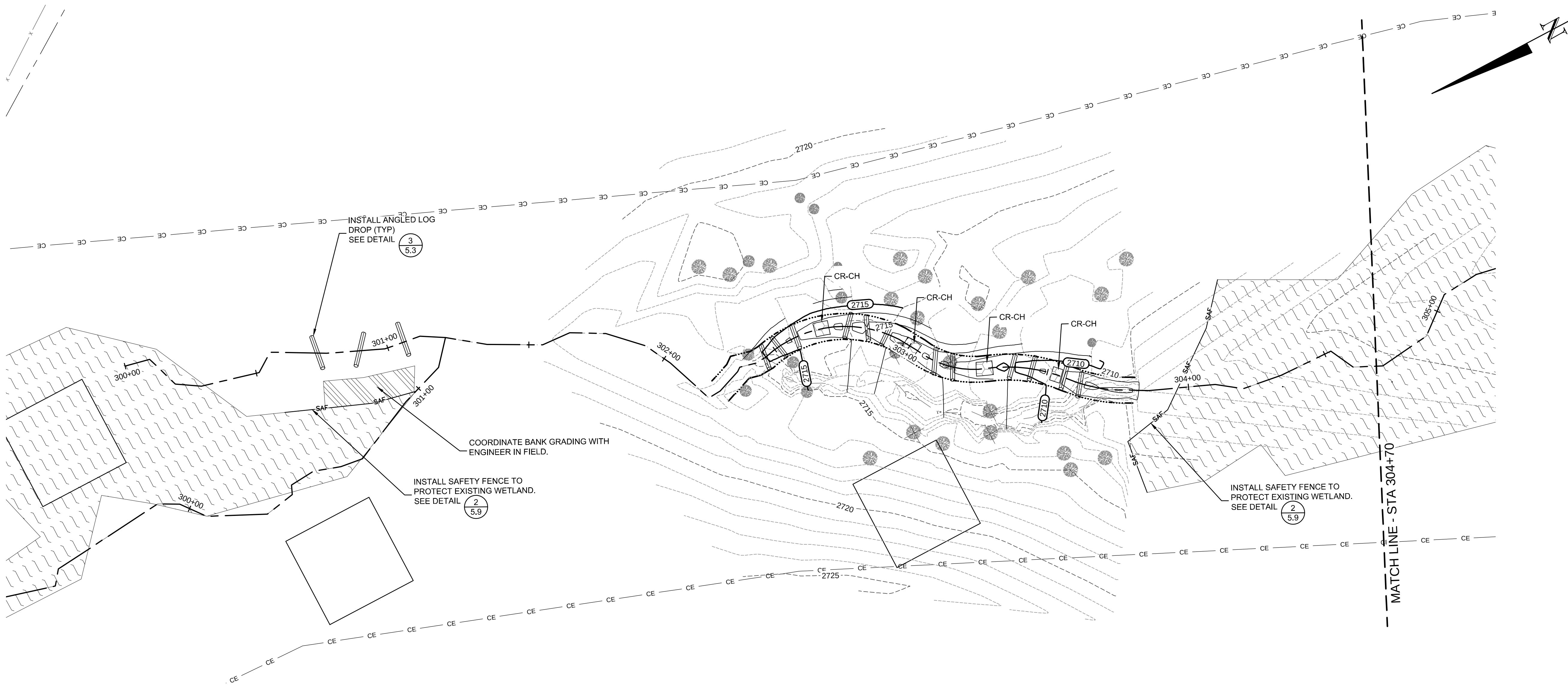

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Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

UT2

Stream Plan and Profile

Revisions:

Date: October 9, 2013
Job Number: 005-02123
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Drawn By: JCK
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SCO Project No.: 07-07088-03

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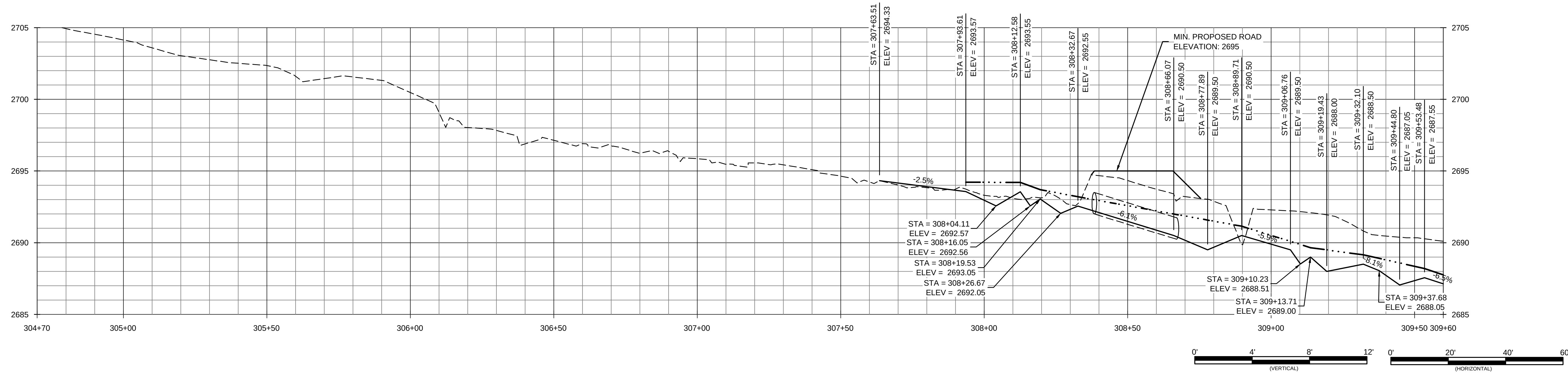

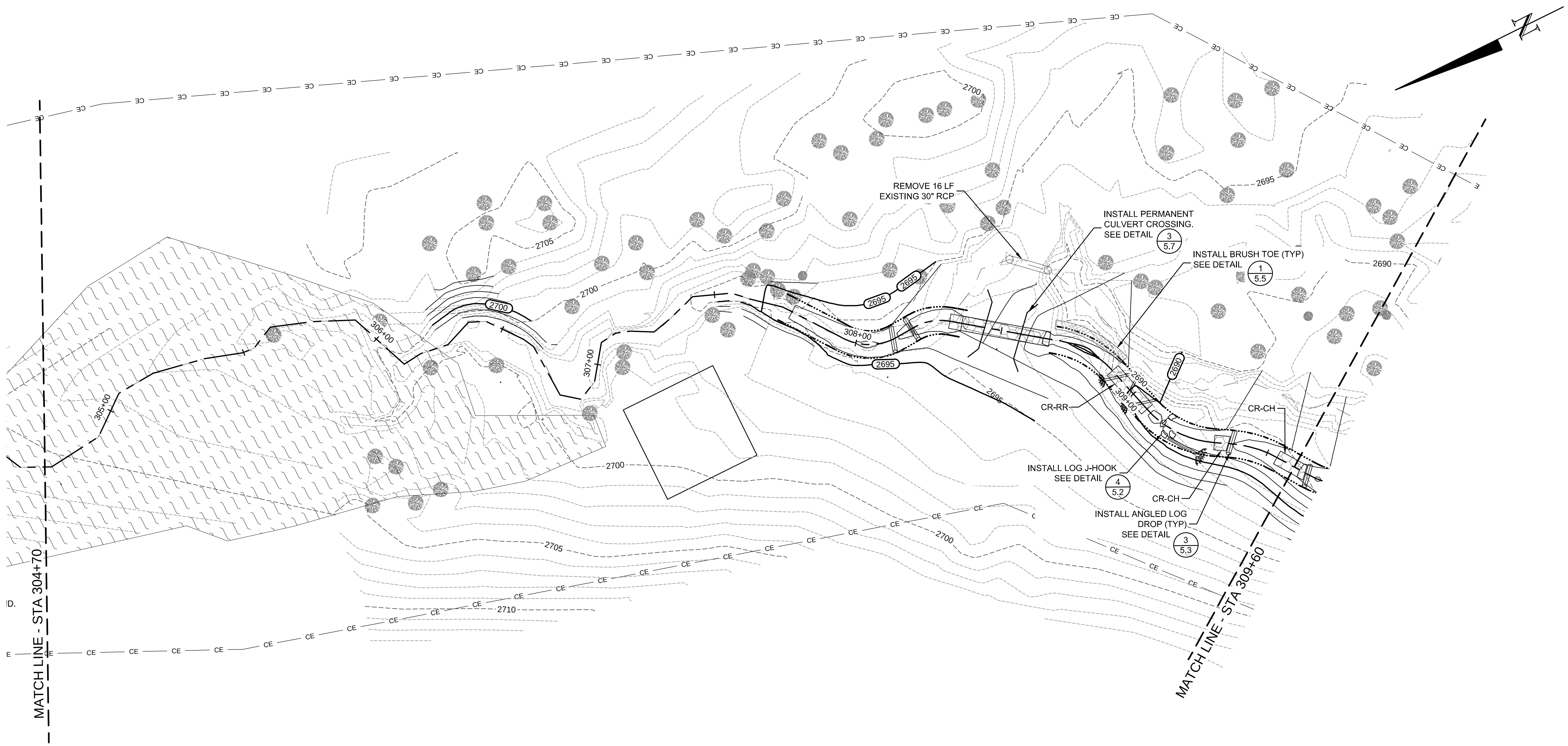

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UT2
Stream Plan and Profile

Revisions:

Date:	October 9, 2013
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Designed By:	CMH
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SCO Project No.: 07-07088-03	

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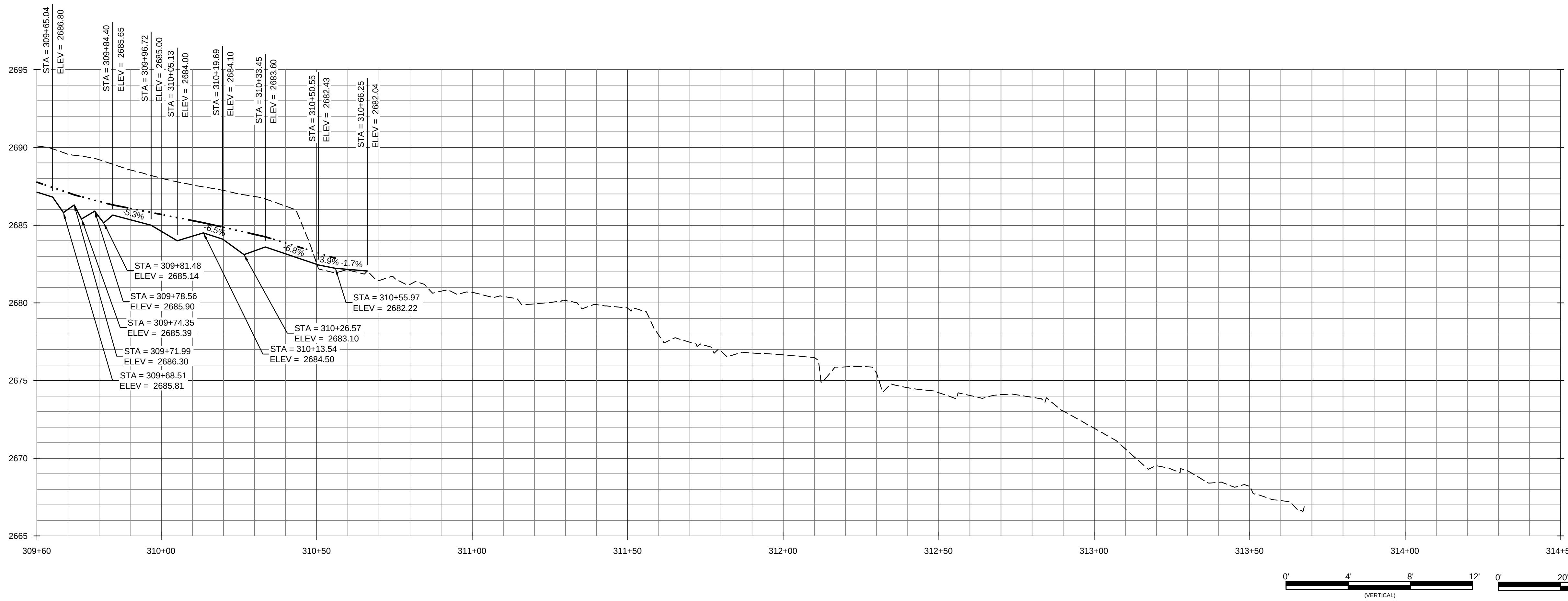

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Alleghany County, North Carolina

UT2

Stream Plan and Profile

Revisions:

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SCO Project No.: 07-07088-03

Sheet 2.11

October 8, 2013

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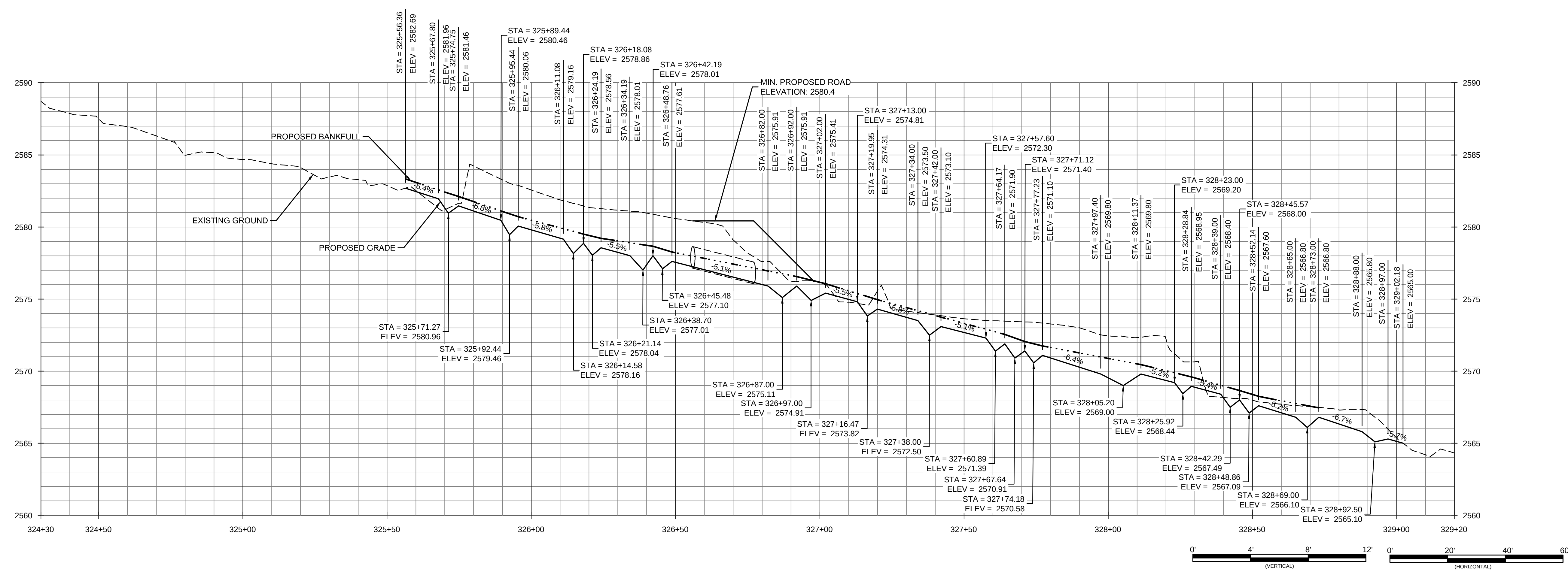

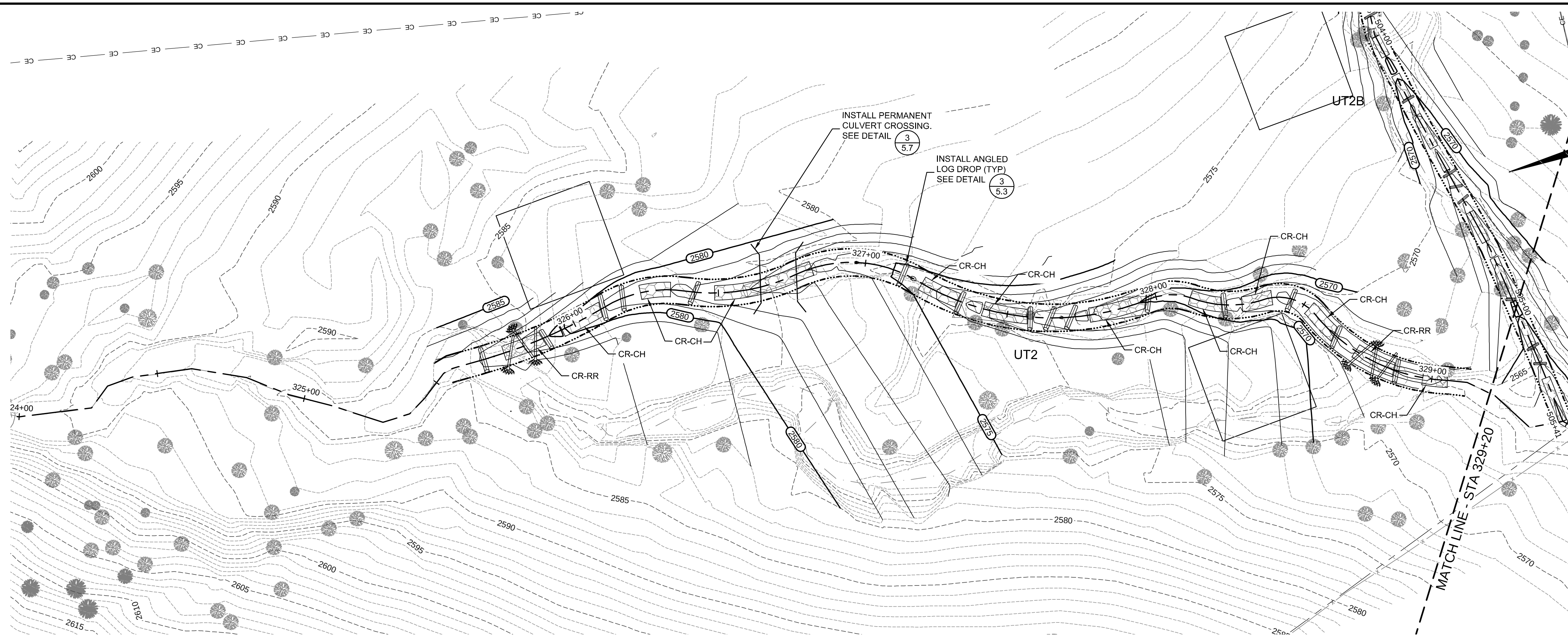

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Alleghany County, North Carolina

UT2
Stream Plan and Profile

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Date: October 9, 2013
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SCO Project No. 07-07688-01

Sheet 2.12

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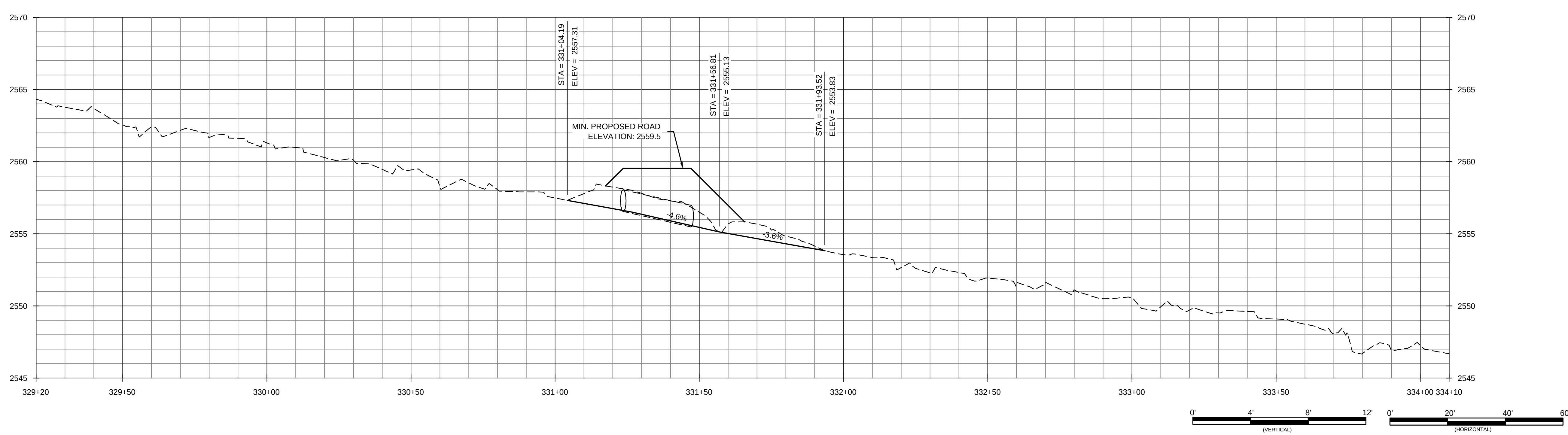

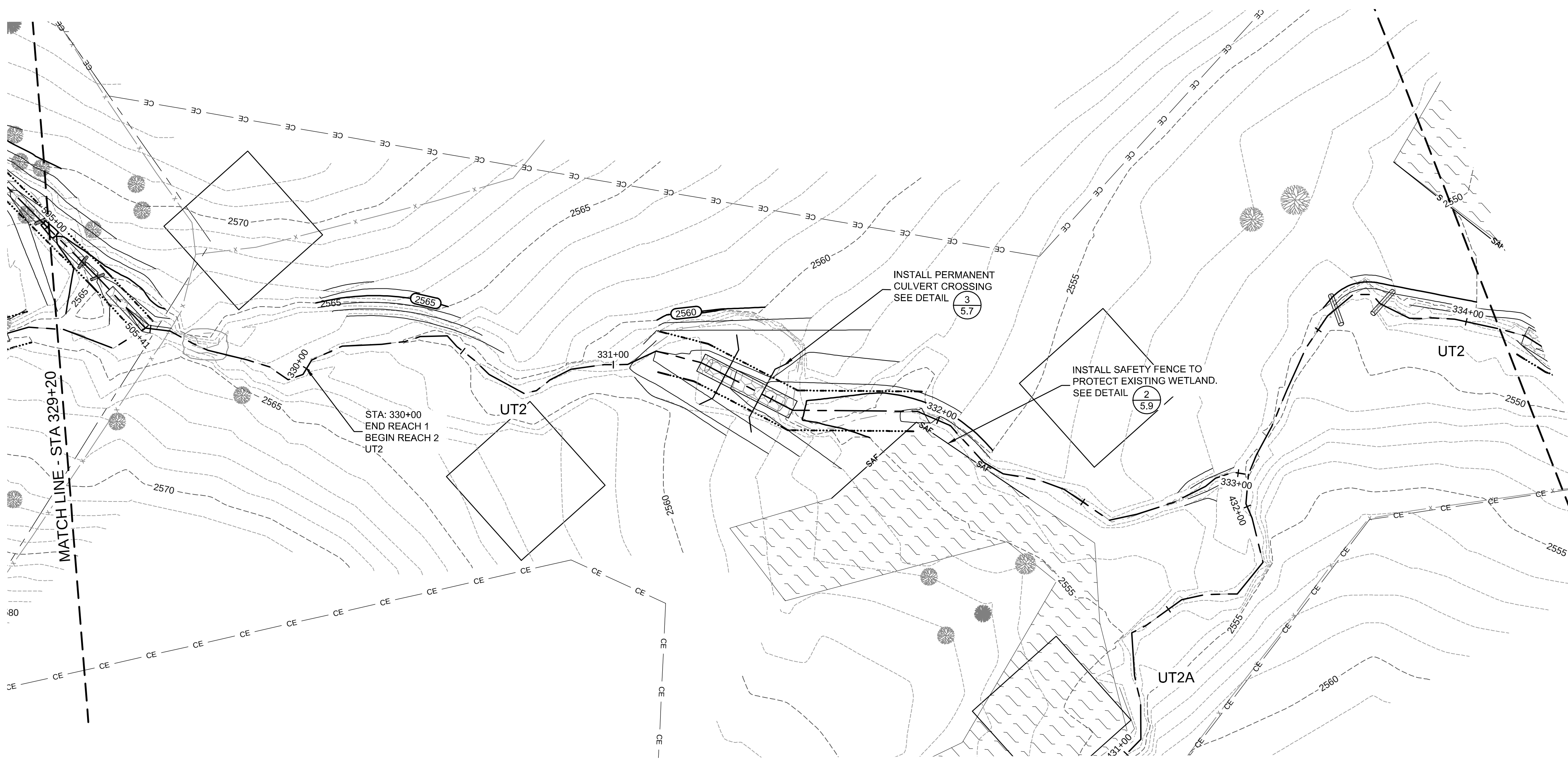

Little Pine Creek III Stream & Wetland Restoration Project

Alleghany County, North Carolina

UT2
Stream Plan and Profile

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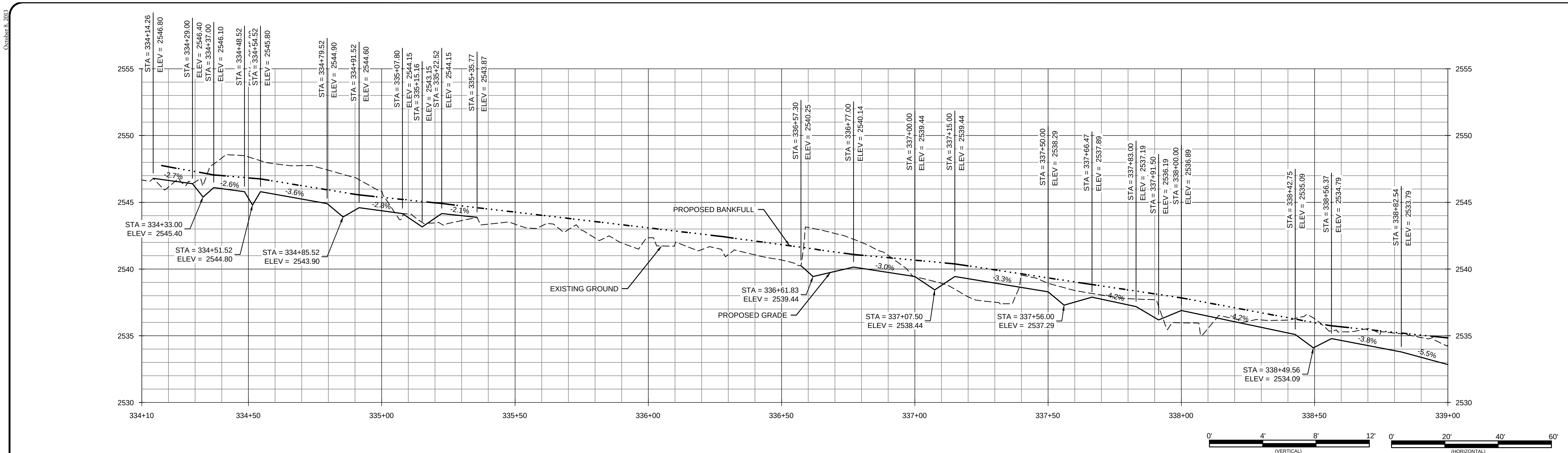

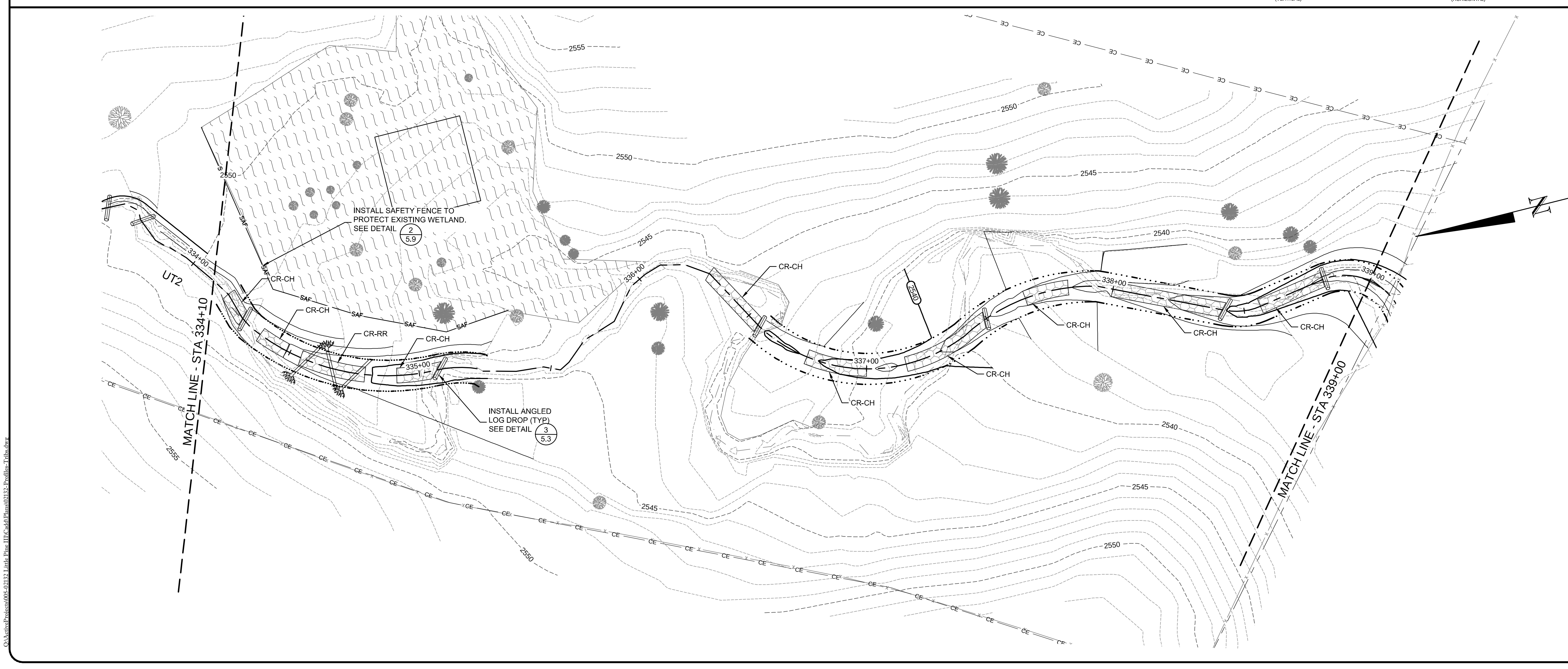

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Alleghany County, North Carolina

UT2
Stream Plan and Profile

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SCO Project No.:	07-07088-03

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October 8, 2013

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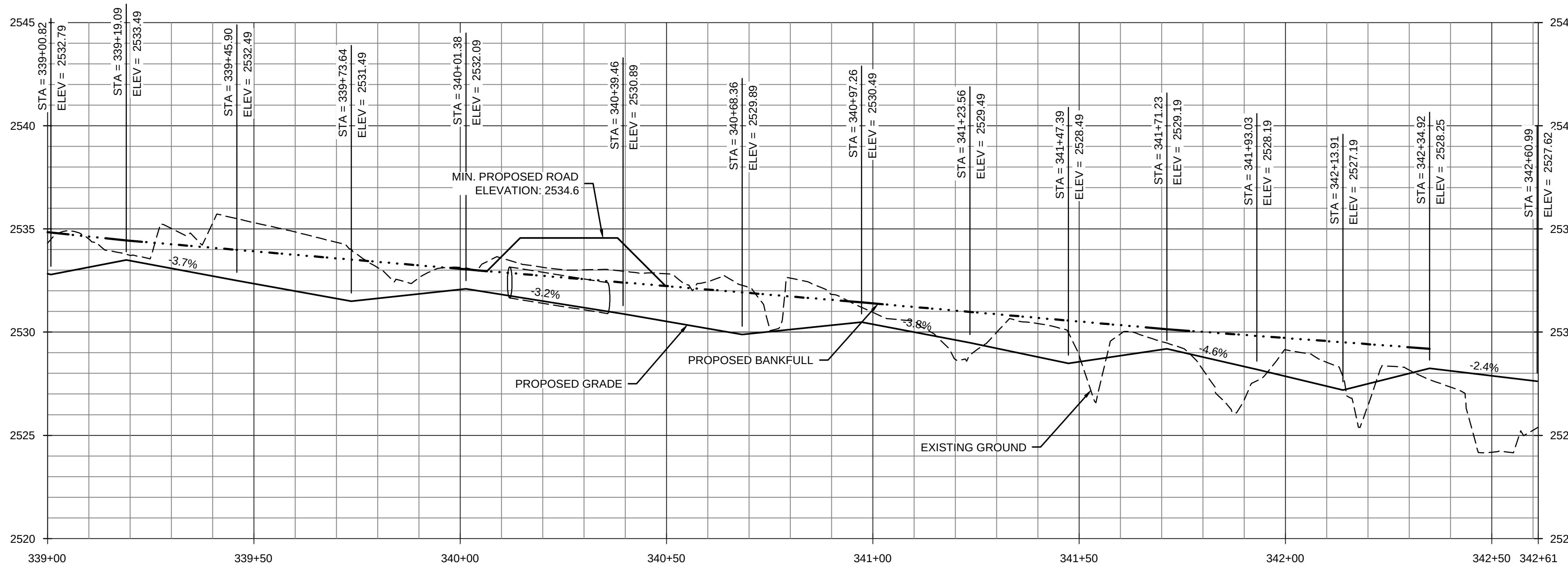

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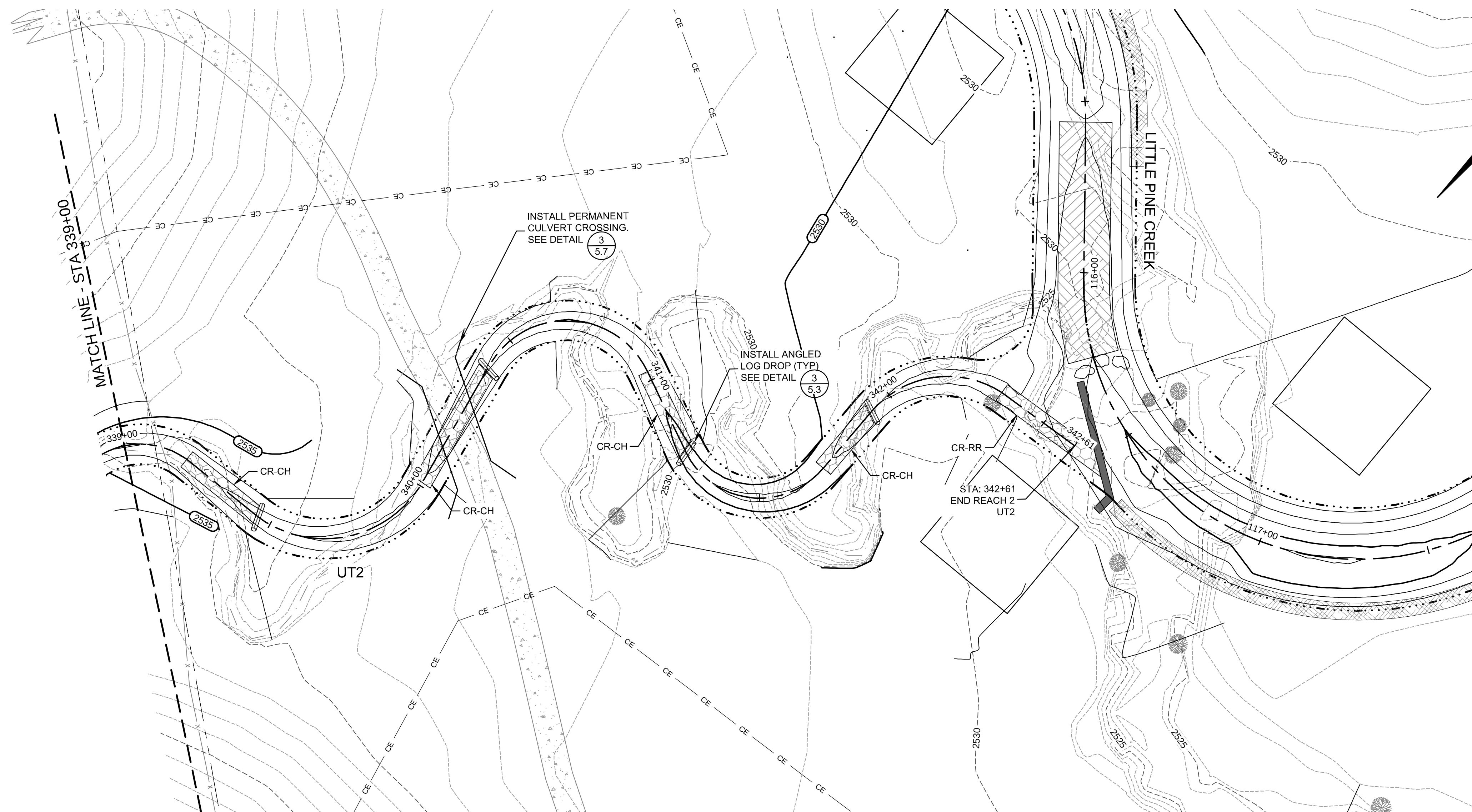
0' 20' 40' 60' (HORIZONTAL)



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Alleghany County, North Carolina

UT2

Stream Plan and Profile

Revisions:

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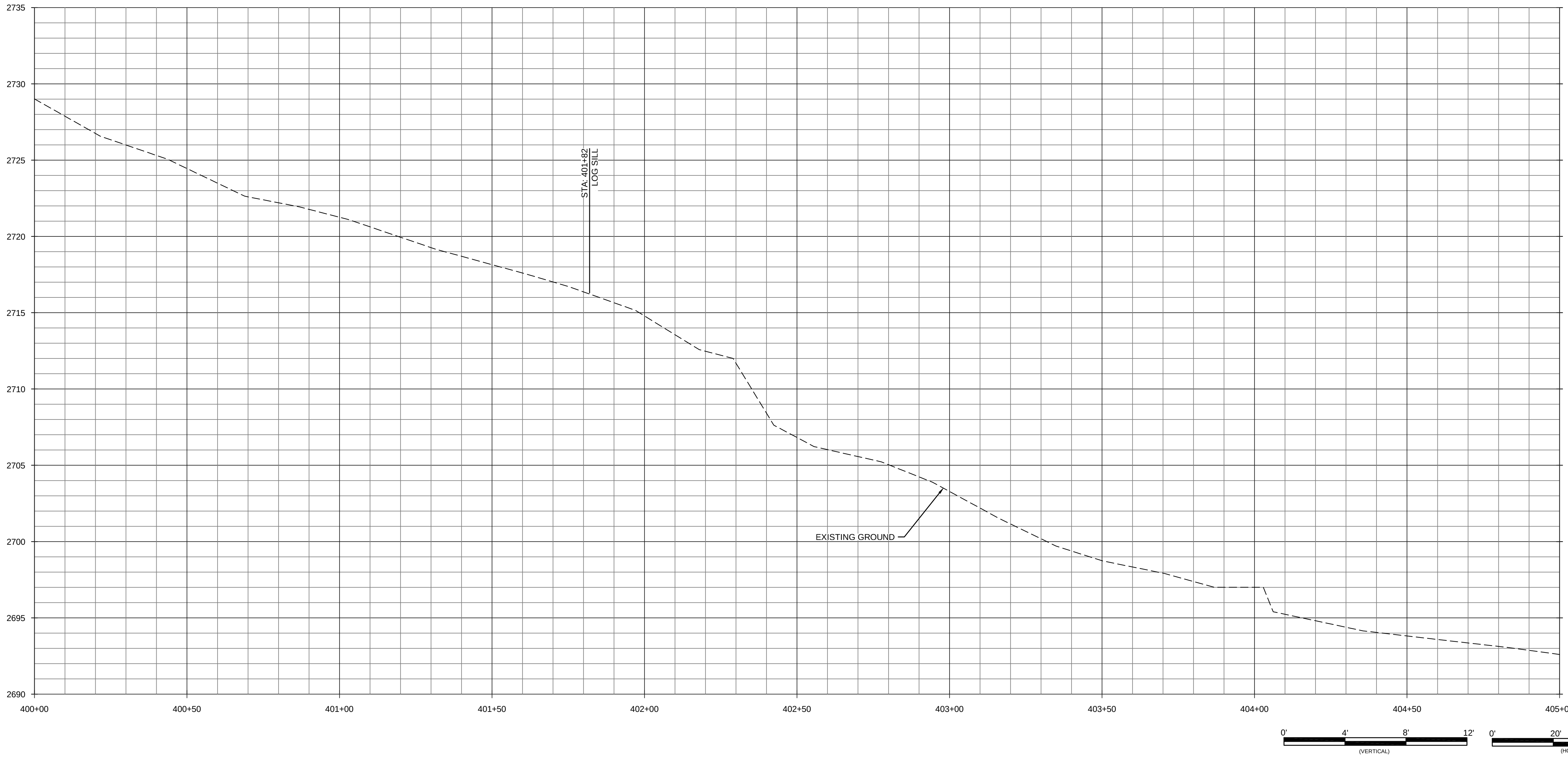

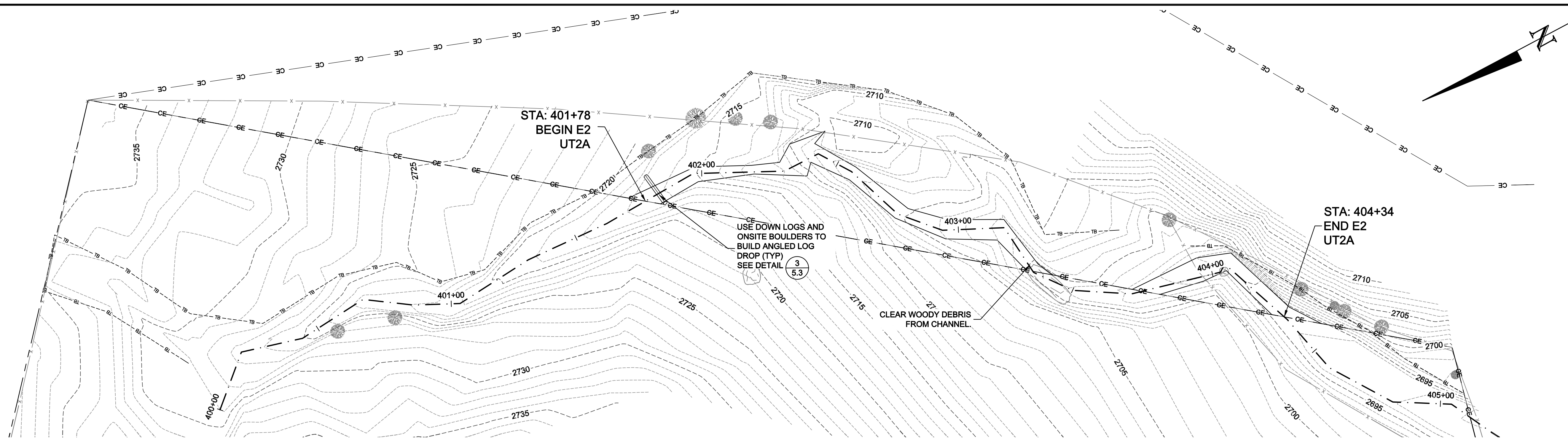

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Little Pine Creek III Stream & Wetland Restoration Project
Alleghany County, North Carolina

UT2A
Stream Plan and Profile

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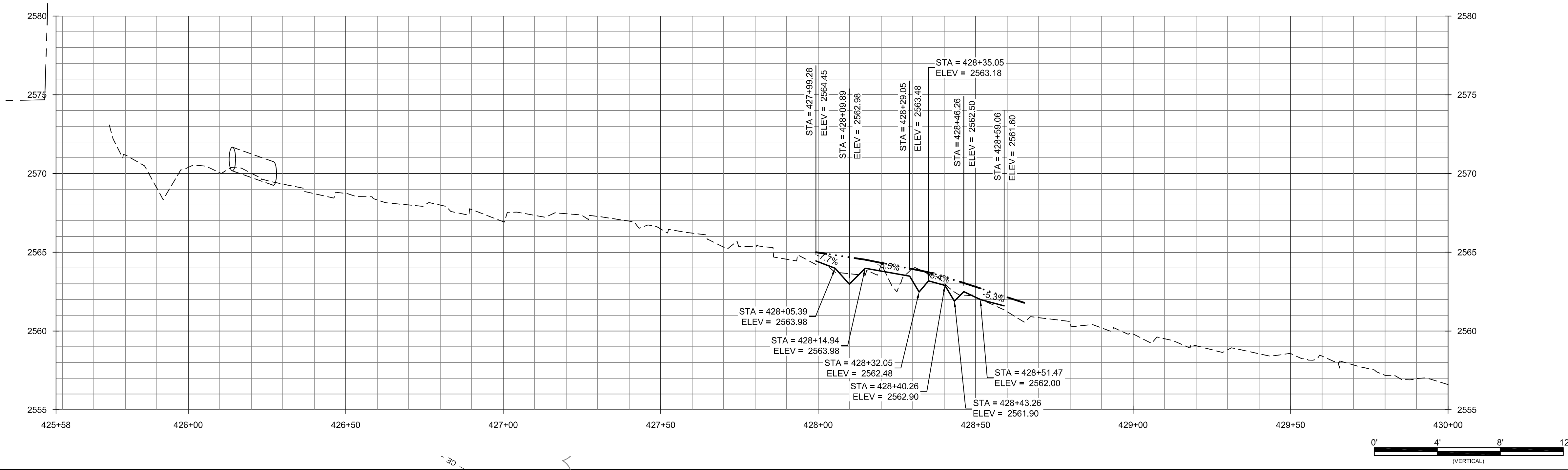

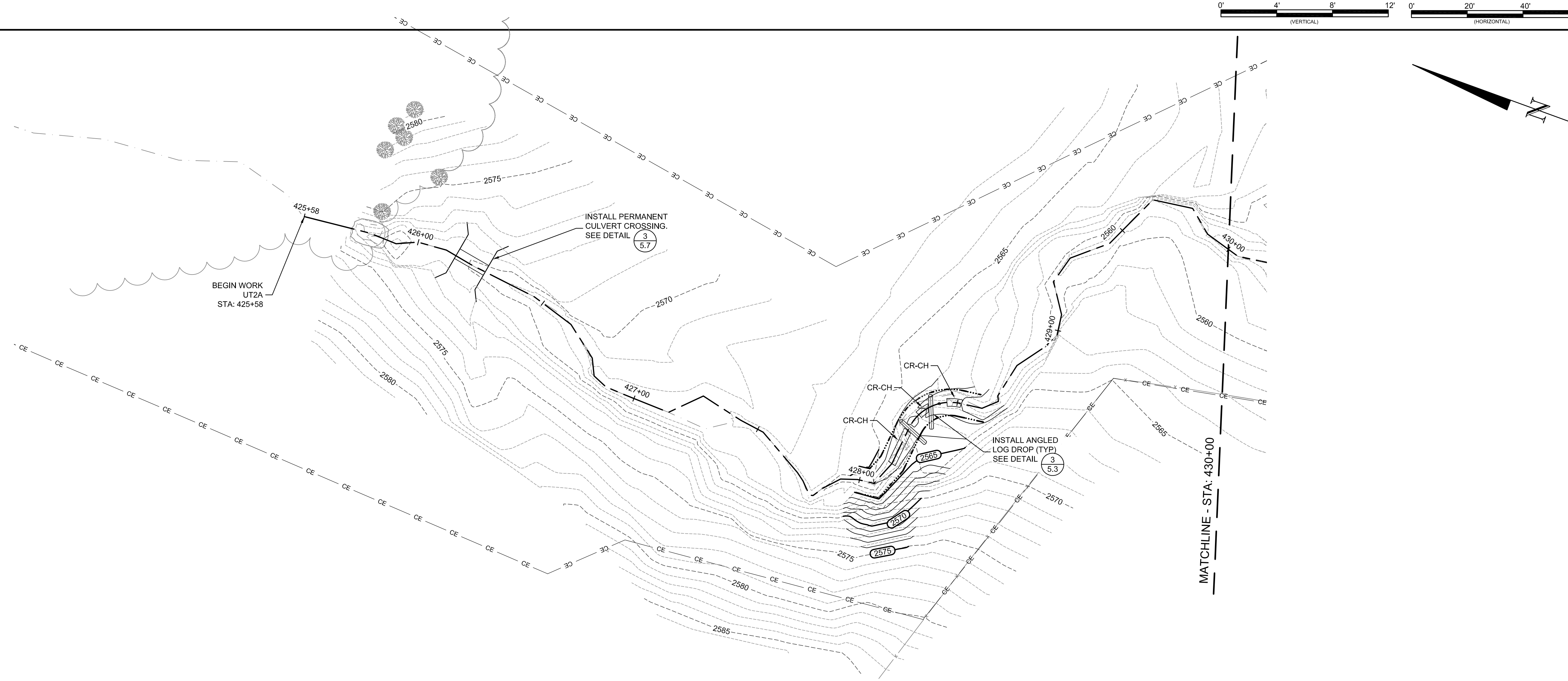

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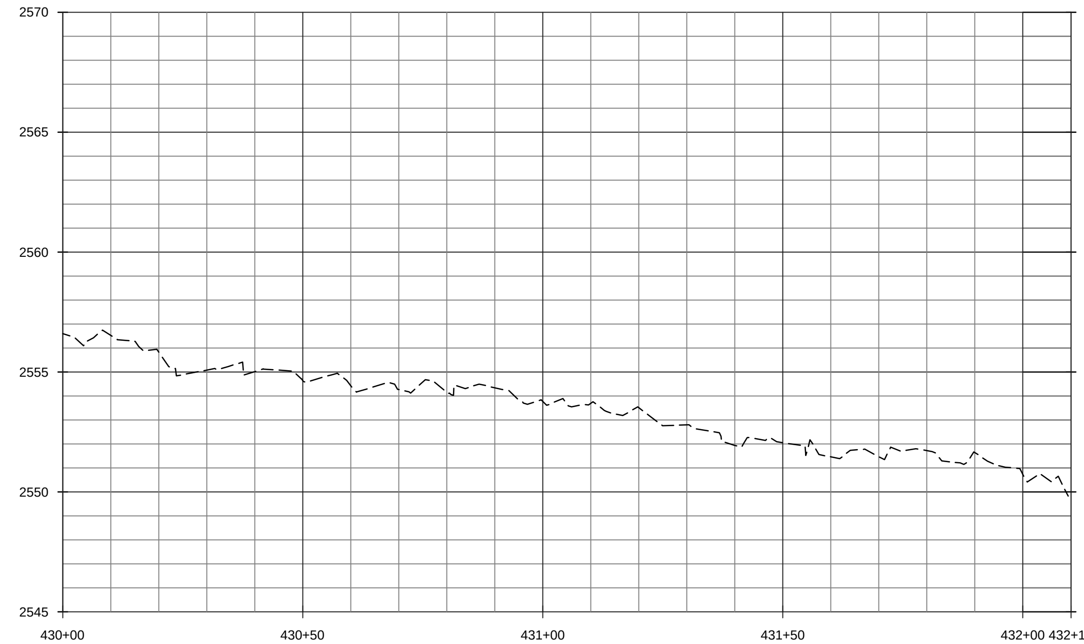

0' 4' 8' 12' (VERTICAL)
0' 20' 40' 60' (HORIZONTAL)

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Alleghany County, North Carolina

UT2A
Stream Plan and Profile

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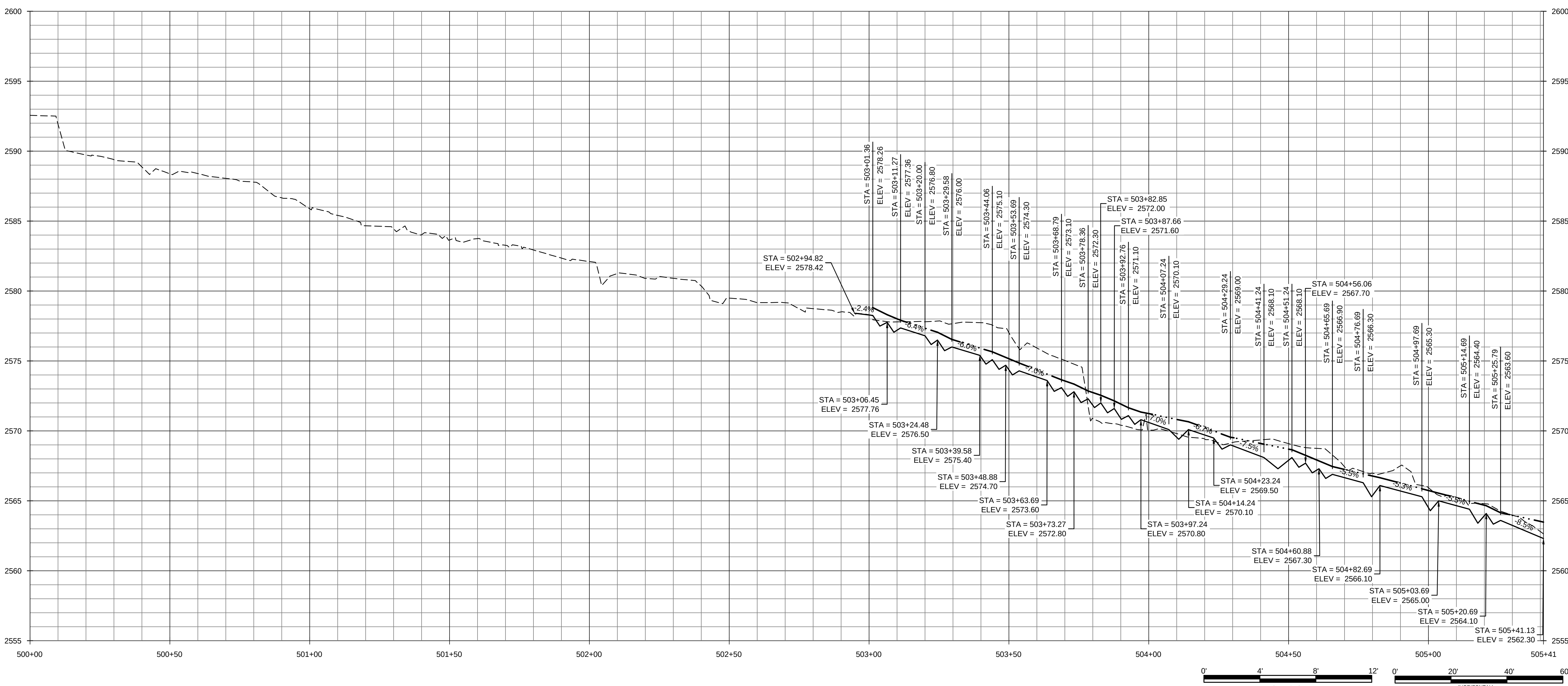

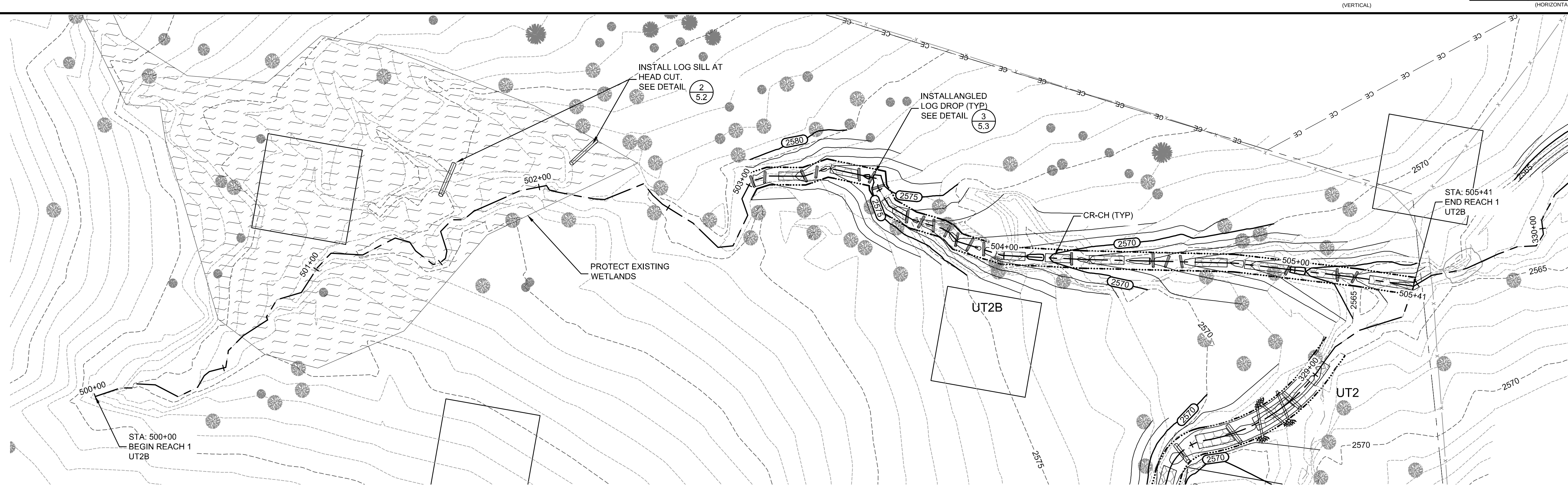

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UT2B
Stream Plan and Profile

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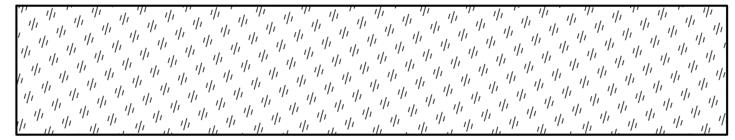
Drawn By:	JCK
Checked By:	EGR
SCO Project No. 07-07088-03	

Sheet 2.19

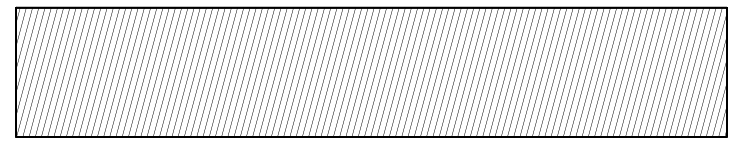
October 8, 2013

March 5, 2014

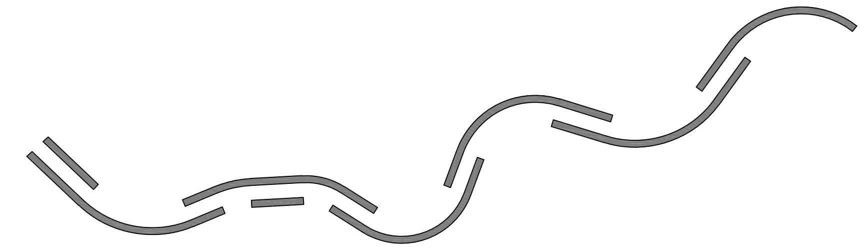
RIPARIAN BUFFER PLANTING ZONE						
Species	Common Name	Max. Spacing	Indiv. Spacing	Min. Caliper	Stratum	#
Sassafras albidum	Sassafras	12 ft	6-12 ft	0.25"-1.0"		5%
Liriodendron tulipifera	Tulip Poplar	12 ft	6-12 ft	0.25"-1.0"		15%
Quercus prinus	Chestnut Oak	12 ft	6-12 ft	0.25"-1.0"		5%
Platanus occidentalis	Sycamore	12 ft	6-12 ft	0.25"-1.0"		20%
Betula nigra	River Birch	12 ft	6-12 ft	0.25"-1.0"		10%
Cornus florida	Flowering Dogwood	12 ft	6-12 ft	0.25"-1.0"		10%
Aesculus octrandra	Yellow Buckeye	12 ft	6-12 ft	0.25"-1.0"		5%
Fraxinus americana	White Ash	12 ft	6-12 ft	0.25"-1.0"		20%
Quercus rubra	Northern Red Oak	12 ft	6-12 ft	0.25"-1.0"		10%



SLOPE BUFFER PLANTING ZONE						
Species	Common Name	Max. Spacing	Indiv. Spacing	Min. Caliper	Stratum	#
Prunus serotina	Black Cherry	12 ft	6-12 ft	0.25"-1.0"		10%
Liriodendron tulipifera	Tulip Poplar	12 ft	6-12 ft	0.25"-1.0"		20%
Quercus prinus	Chestnut Oak	12 ft	6-12 ft	0.25"-1.0"		10%
Quercus coccinea	Scarlet Oak	12 ft	6-12 ft	0.25"-1.0"		10%
Carya glabra	Pignut Hickory	12 ft	6-12 ft	0.25"-1.0"		15%
Cornus florida	Flowering Dogwood	12 ft	6-12 ft	0.25"-1.0"		10%
Aesculus octrandra	Yellow Buckeye	12 ft	6-12 ft	0.25"-1.0"		5%
Fraxinus americana	White Ash	12 ft	6-12 ft	0.25"-1.0"		10%
Quercus rubra	Northern Red Oak	12 ft	6-12 ft	0.25"-1.0"		10%

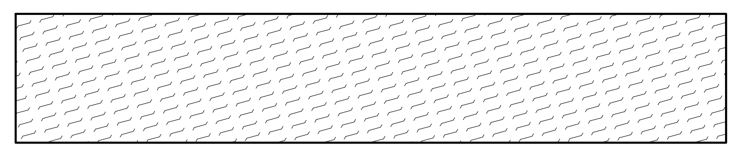


STREAMBANK PLANTING ZONE						
Live Stakes and Herbacous Plugs						
Species	Common Name	Max. Spacing	Indiv. Spacing	Min. Size	Stratum	# Plants
Cornus amomum	Silky Dogwood	3 ft	3ft	0.5"-1.0" cal.		25%
Salix nigra	Black Willow	3 ft	3ft	0.5"-1.0" cal.		15%
Salix sericea	Silky Willow	3 ft	3ft	0.5"-1.0" cal.		50%
Sambucus nigra ssp canadensis	Elderberry	3 ft	3ft	0.5"-1.0" cal.		10%
Juncus effusus	Common Rush	5 ft	5ft	1"-2" plug		NA

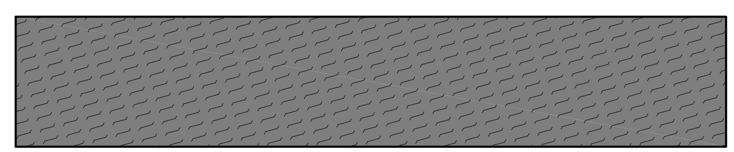


PERMANENT RIPARIAN SEED PLANTING ZONE		
Pure Live Seed (20 lbs/acre)		
Species Name	Common Name	lbs/acre
Agrostis stolonifera	Creeping bentgrass	2.0
Andropogon ternarius	Split beardgrass	0.4
Bouteloua curtipendula	Side oats grama	2.8
Bouteloua gracilis	Blue grama	3.6
Panicum clandestinum	Deer tongue	3.6
Schizachyrium scoparium	Little bluestem	2.8
Sporobolus clandestinus	Rough dropseed	1.6
Vicia villosa	Hairy vetch	0.8
Chasmanthium latifolium	River Oats	1.6
Carex vulpinoidea	Fox sedge	0.8

WETLAND PLANTING ZONE A						
Species	Common Name	Max. Spacing	Indiv. Spacing	Min. Caliper	Stratum	#
Nyssa sylvatica	Black Gum	12 ft	6-12 ft	0.25"-1.0"		10%
Platanus occidentalis	Sycamore	12 ft	6-12 ft	0.25"-1.0"		30%
Betula nigra	River Birch	12 ft	6-12 ft	0.25"-1.0"		20%
Cornus amomum	Silky Dogwood	12 ft	6-12 ft	0.25"-1.0"		15%
Alnus serrulata	Tag Alder	12 ft	6-12 ft	0.25"-1.0"		5%
Acer negundo	Box Elder	12 ft	6-12 ft	0.25"-1.0"		10%
Lindera benzoin	Spicebush	12 ft	6-12 ft	0.25"-1.0"		10%
						100%

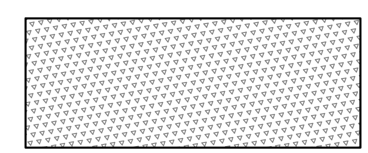


WETLAND PLANTING ZONE B						
Live Stakes or Plugs						
Species	Common Name	Max. Spacing	Indiv. Spacing	Min. Size	Stratum	# Plants
Cornus amomum	Silky Dogwood	3 ft	3ft	0.5"-1.0" cal.		25%
Salix nigra	Black Willow	3 ft	3ft	0.5"-1.0" cal.		10%
Salix sericea	Silky Willow	3 ft	3ft	0.5"-1.0" cal.		40%
Sambucus nigra ssp canadensis	Elderberry	3 ft	3ft	0.5"-1.0" cal.		5%
Juncus effusus	Common Rush	5 ft	5ft	1"-2" plug		NA
Transplants or Tublings						
Species	Common Name	Max. Spacing	Indiv. Spacing	Min. Size	Stratum	# Plants
Alnus serrulata	Tag Alder	12 ft	6-12 ft	0.25"-1.0"		20%



TEMPORARY SEEDING			
APPROVED DATE	SCIENTIFIC NAME	COMMON NAME	DENSITY (LBS/ ACRE)
Nov 1- Apr 30	*Secale Cereale*	Rye Grain	130
May 1 - October 31	*Panicum ramosum*	Browntop Millet	45

PASTURE SEEDING		
Pure Live Seed (42 lbs/acre)		
Species Name	Common Name	lbs/acre
Dactylis glomerata	Orchard Grass	40
Trifolium repens	White Ladino Clover	2



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Little Pine Creek III Stream & Wetland Restoration Project
Allegheny County, North Carolina

Plant Lists
Planting

Revisions:

Date: October 9, 2013
Job Number: 005-02123
Designed By: CMB
Drawn By: JCK
Checked By: EGR
SCO Project No.: 07-07088-03

Sheet 3.0

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Alleghany County, North Carolina

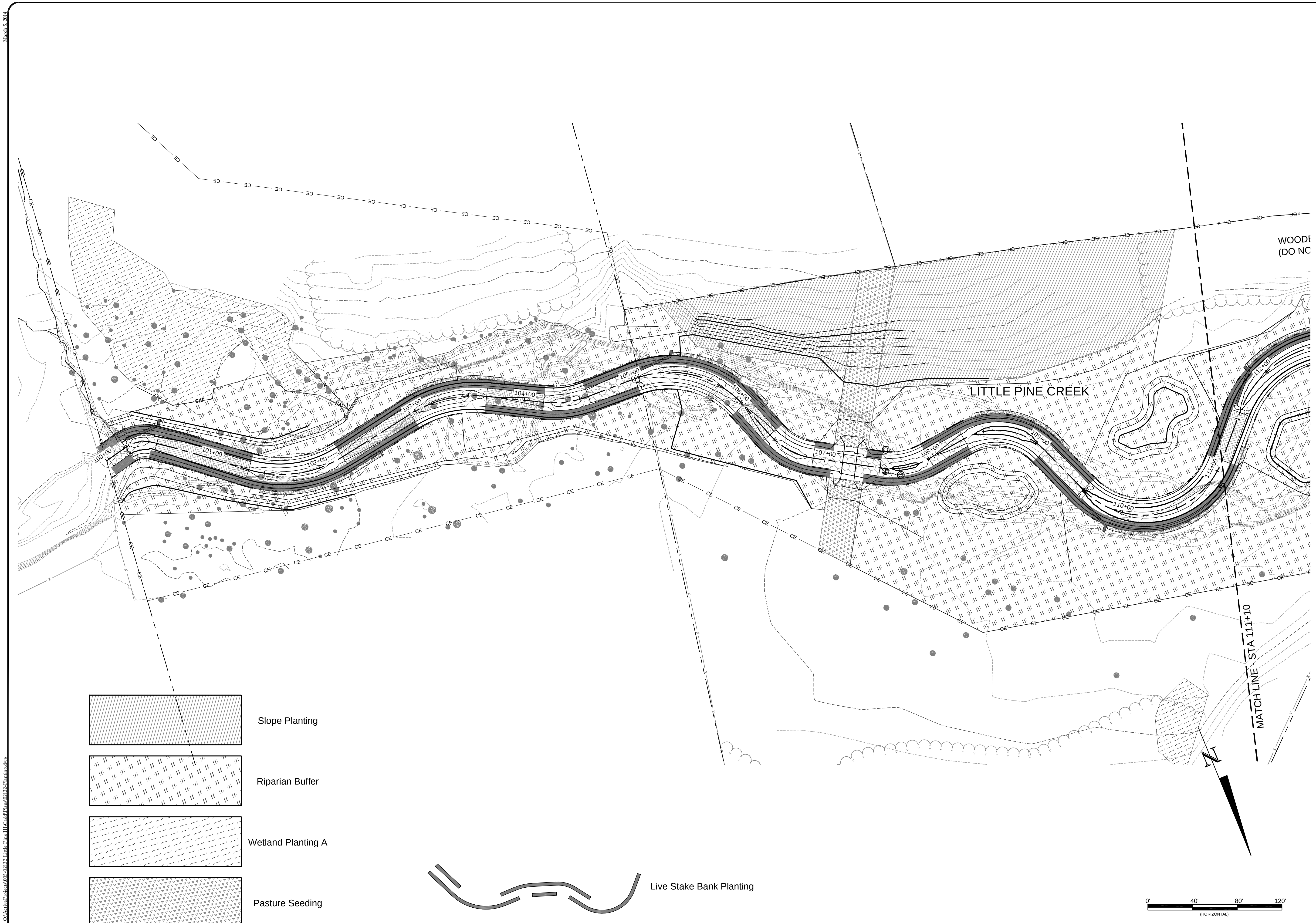
Planting Overview

Revisions:

Date:	October 9, 2013
Job Number:	005-02123
Designed By:	CMB
Drawn By:	JCK
Checked By:	EGR
SCO Project No.: 07-07088-03	

Sheet 3.1

March 5, 2014



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Little Pine Creek
Planting

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Checked By:	EGR
SCO Project No.: 07-07088-03	

3.2

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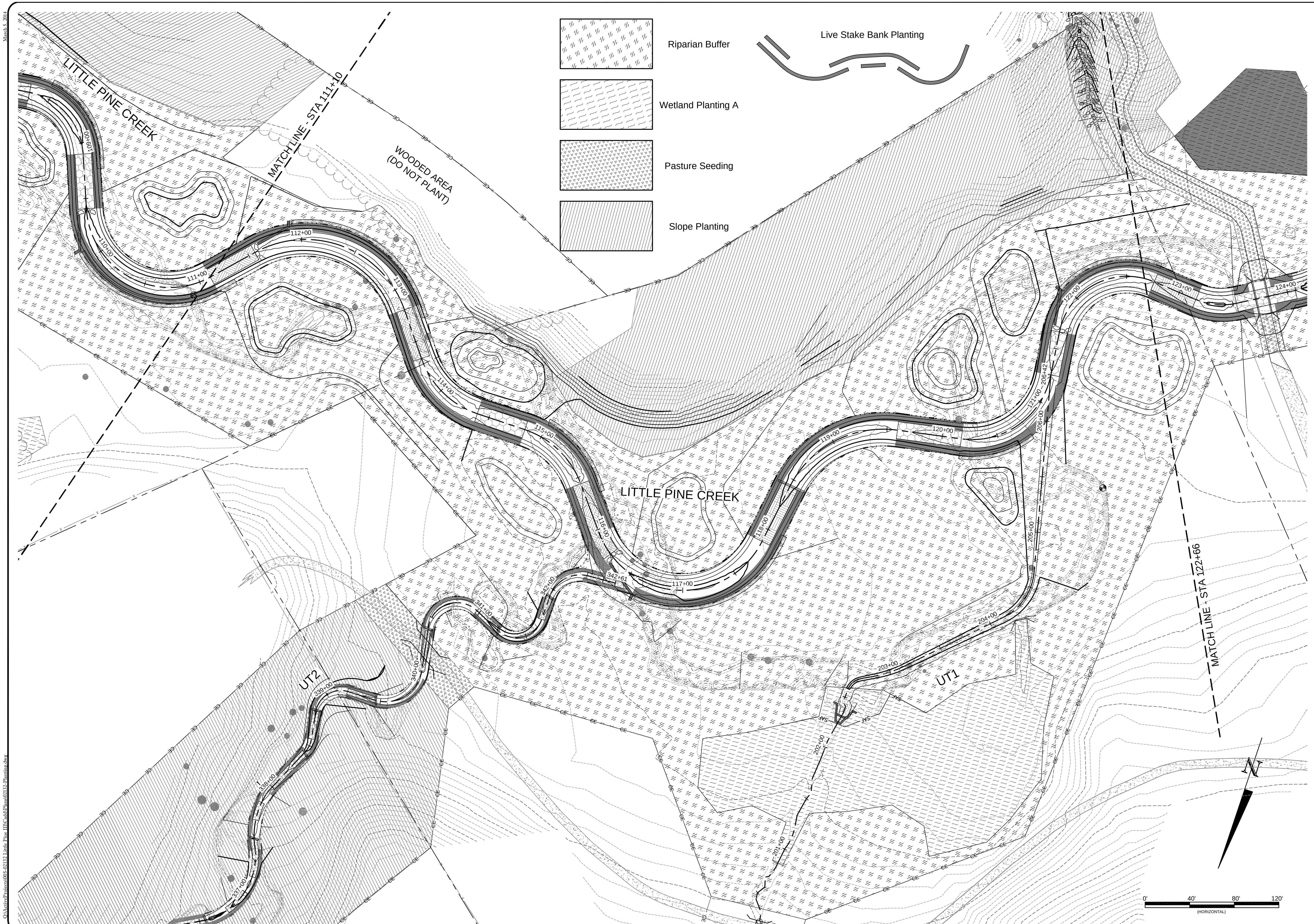

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Little Pine Creek & UT1
Planting

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3.3

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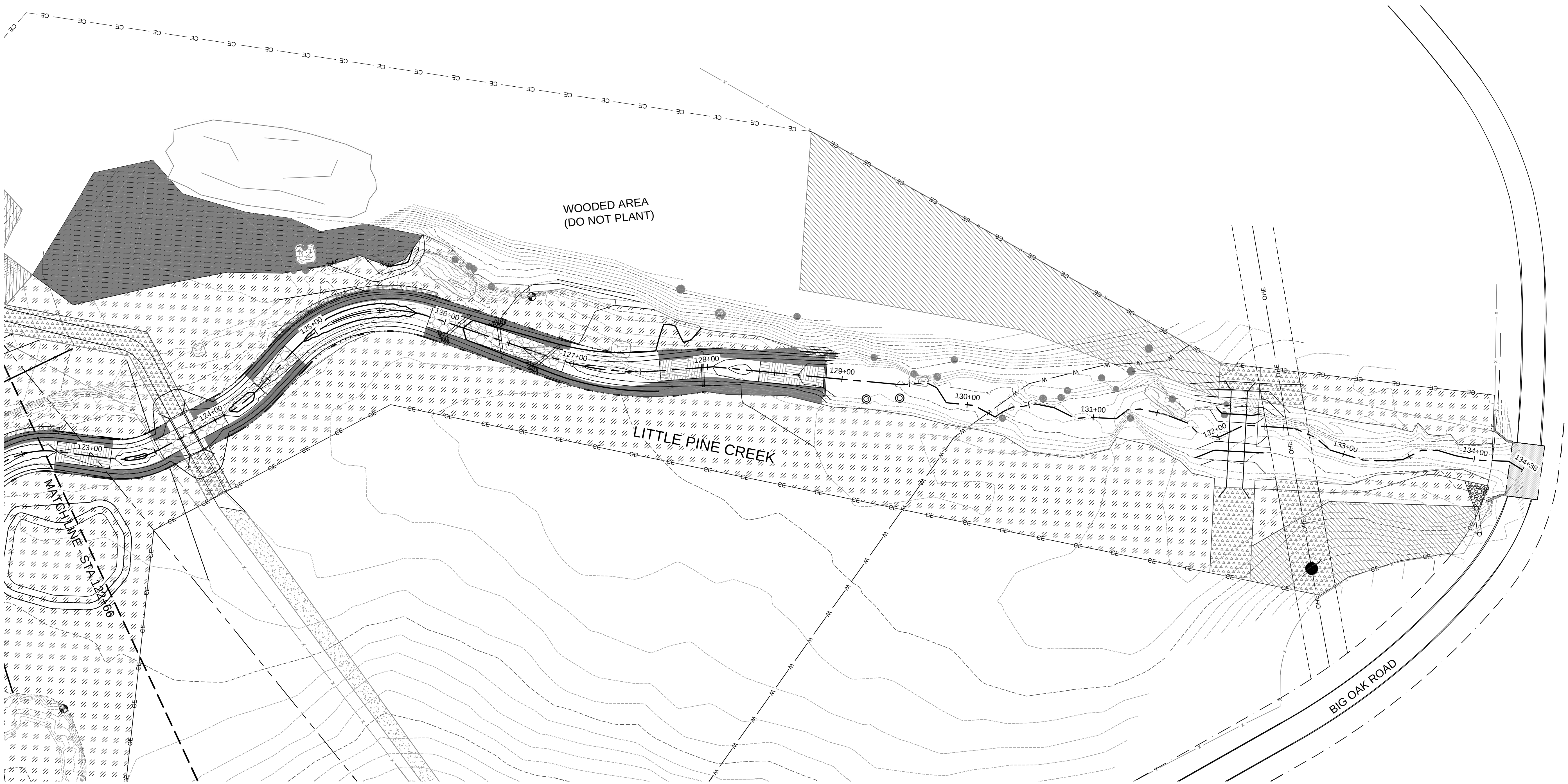

Slope Planting

Riparian Buffer

Wetland Planting B

Pasture Seeding

Live Stake Bank Planting

0' 40' 80' 120'
(HORIZONTAL)

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Alleghany County, North Carolina

Little Pine Creek
Planting

Date: October 9, 2013
Job Number: 005-02123
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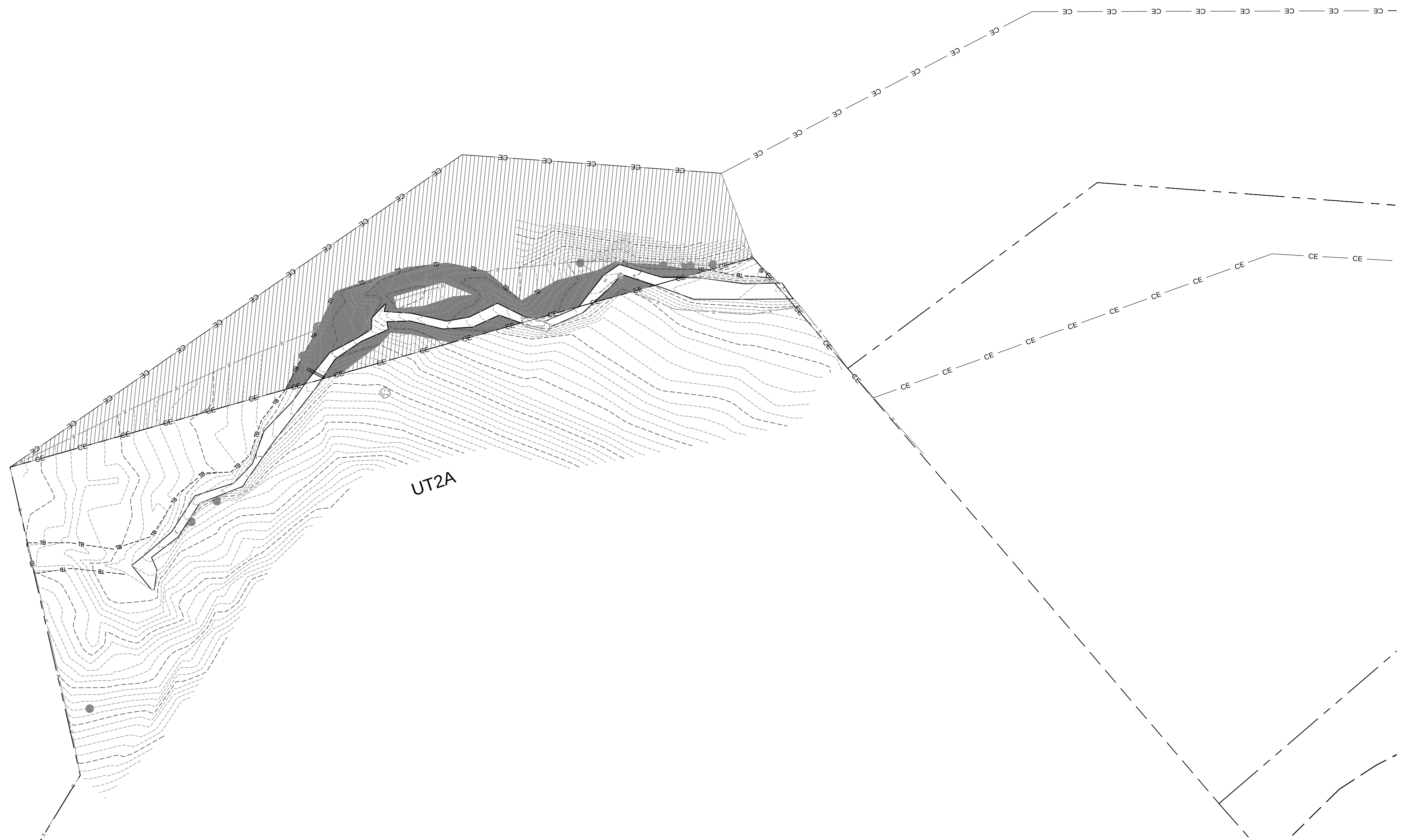
Drawn By: JCK
Checked By: EGR
SCO Project No.: 07-07088-03

Revisions:

3.4
Sheet

March 5, 2014



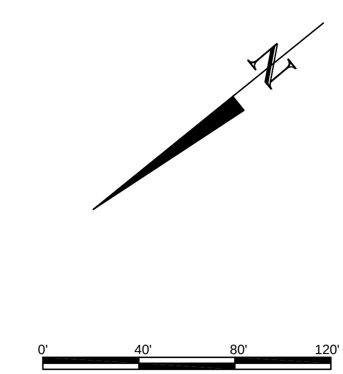
Slope Planting

Riparian Buffer

Wetland Planting A

Pasture Seeding

Live Stake Bank Planting



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UT2A
Planting

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3.5

Sheet

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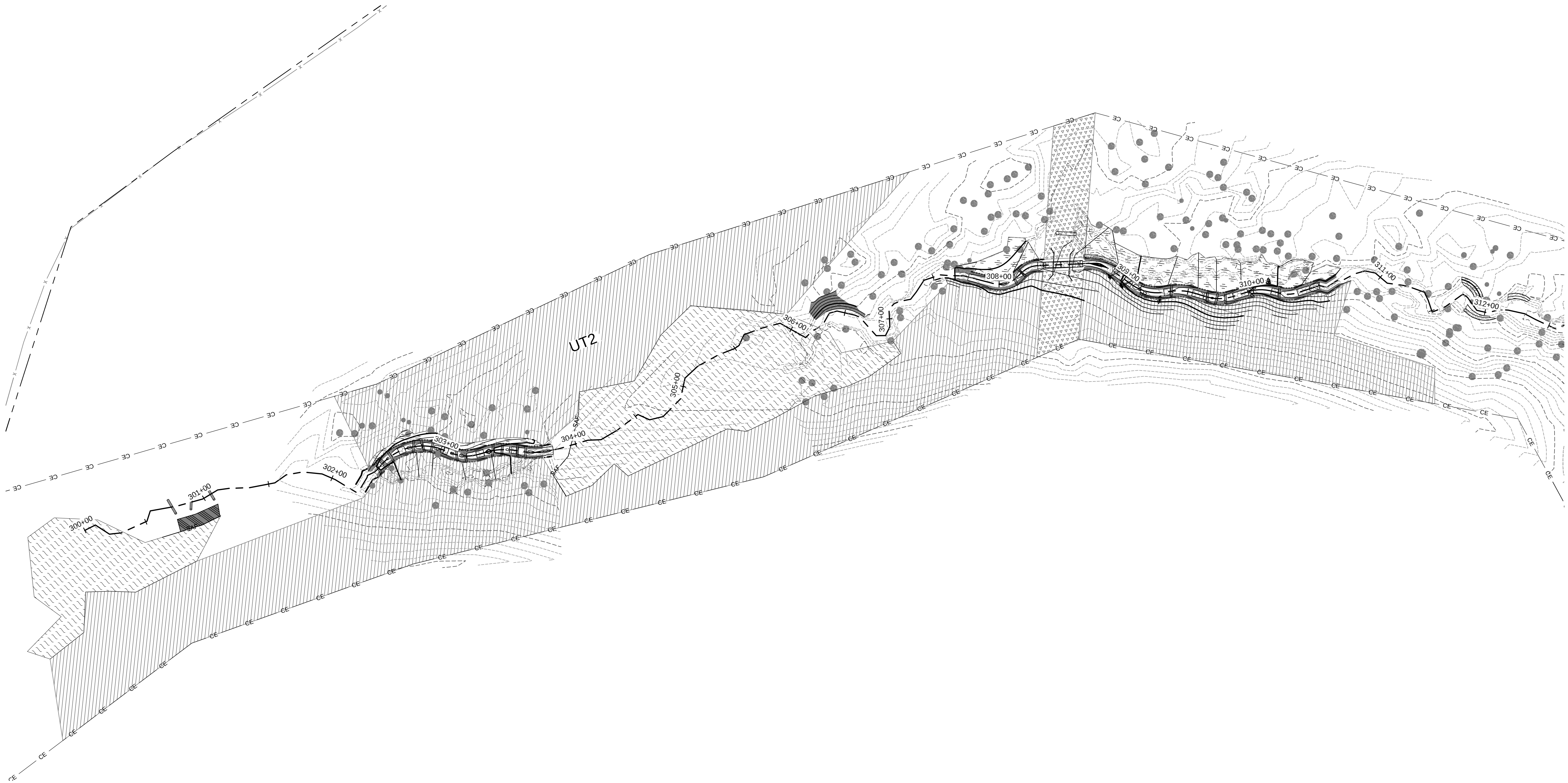


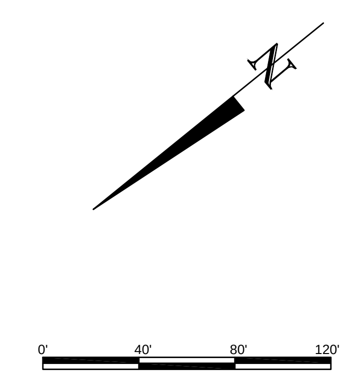
Slope Planting

Riparian Buffer

Wetland Planting A

Pasture Seeding

Live Stake Bank Planting



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UT2
Planting

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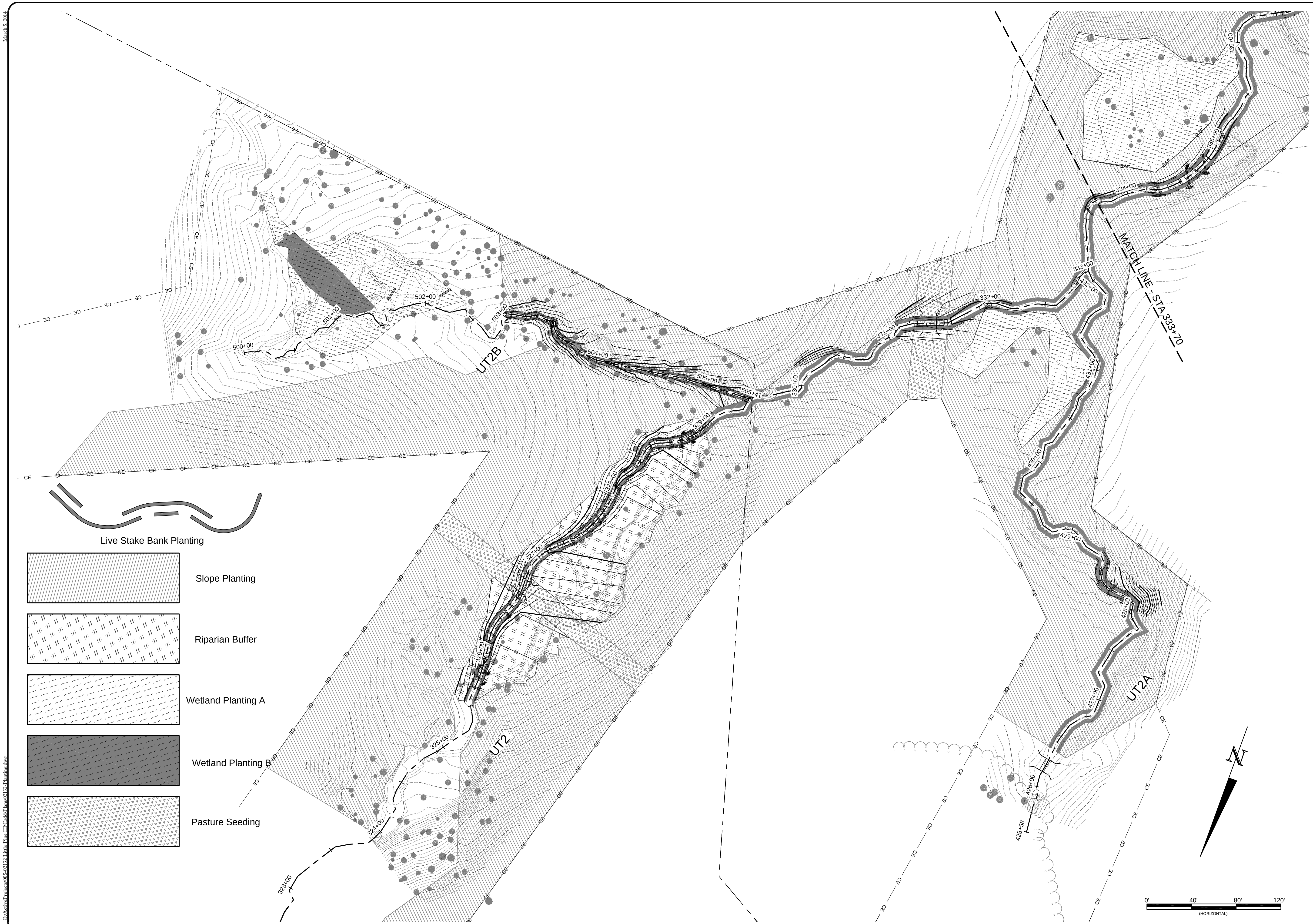
SCO Project No.:	07-07088-03

3.6

Sheet



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Alleghany County, North Carolina

UT2, UT2A, UT2B
Planting

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3.7
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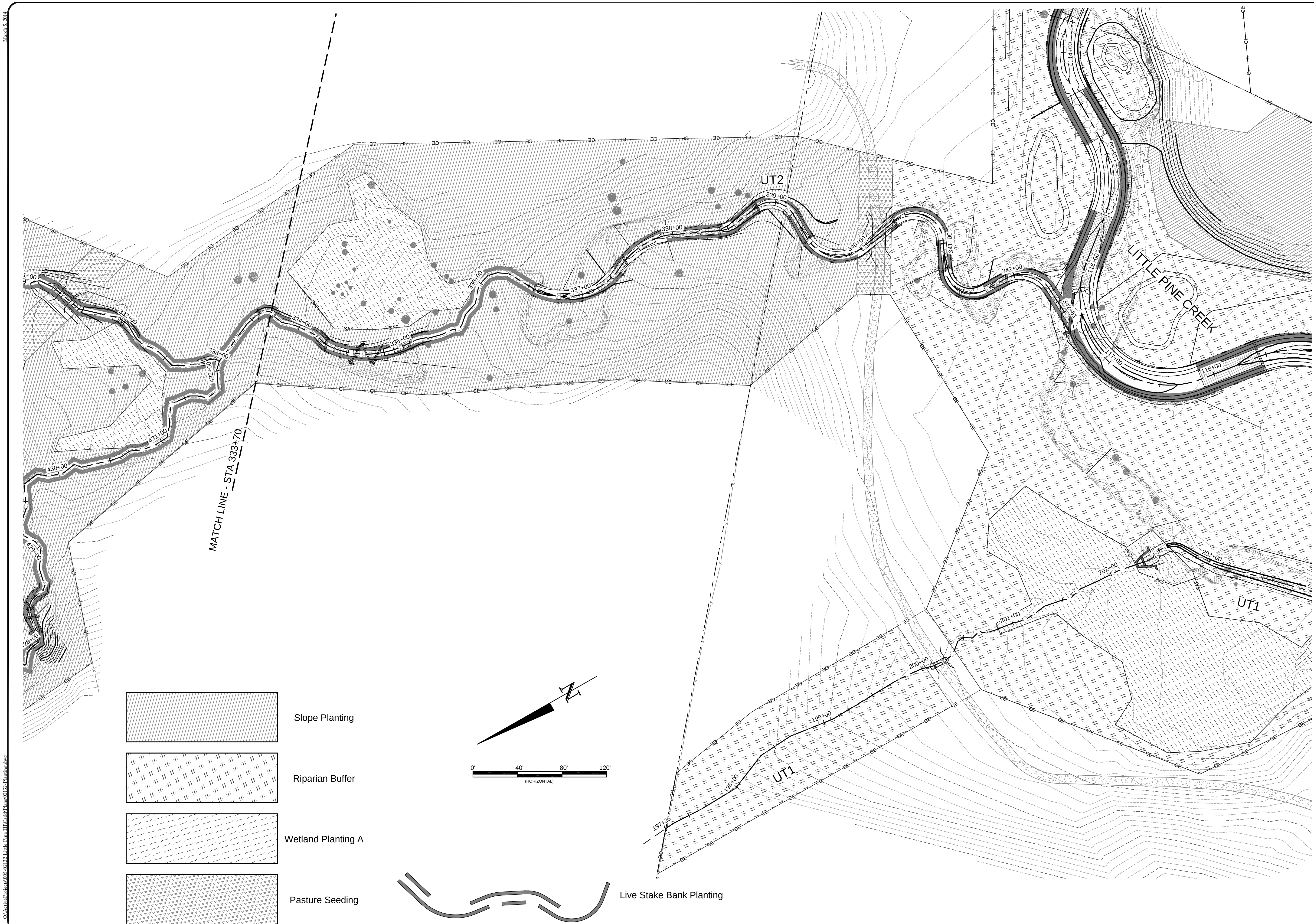

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UT2
Planting

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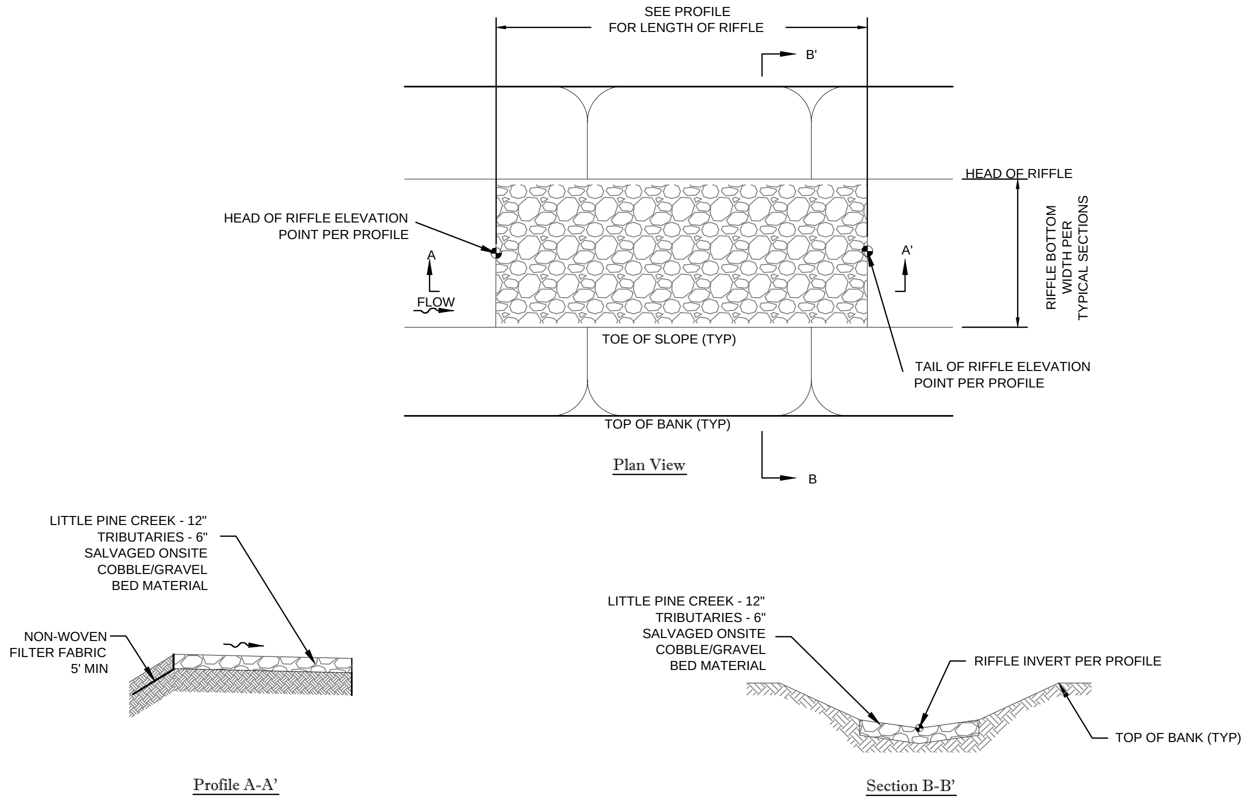
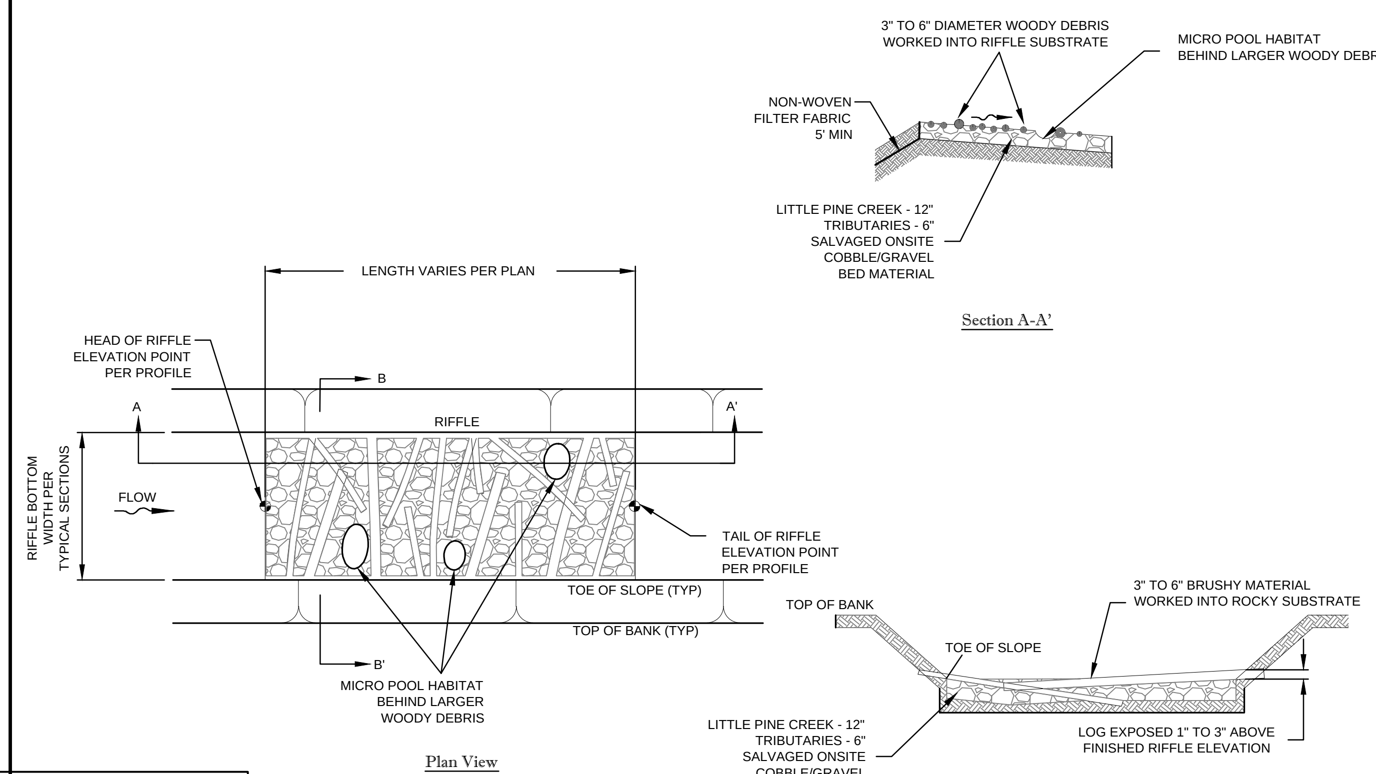
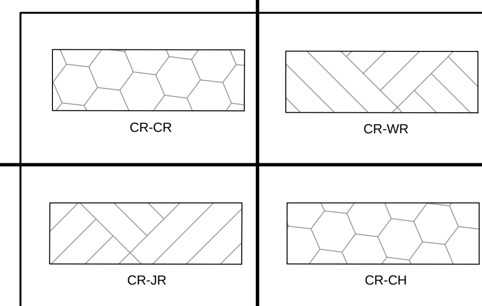
Sheet 3.8

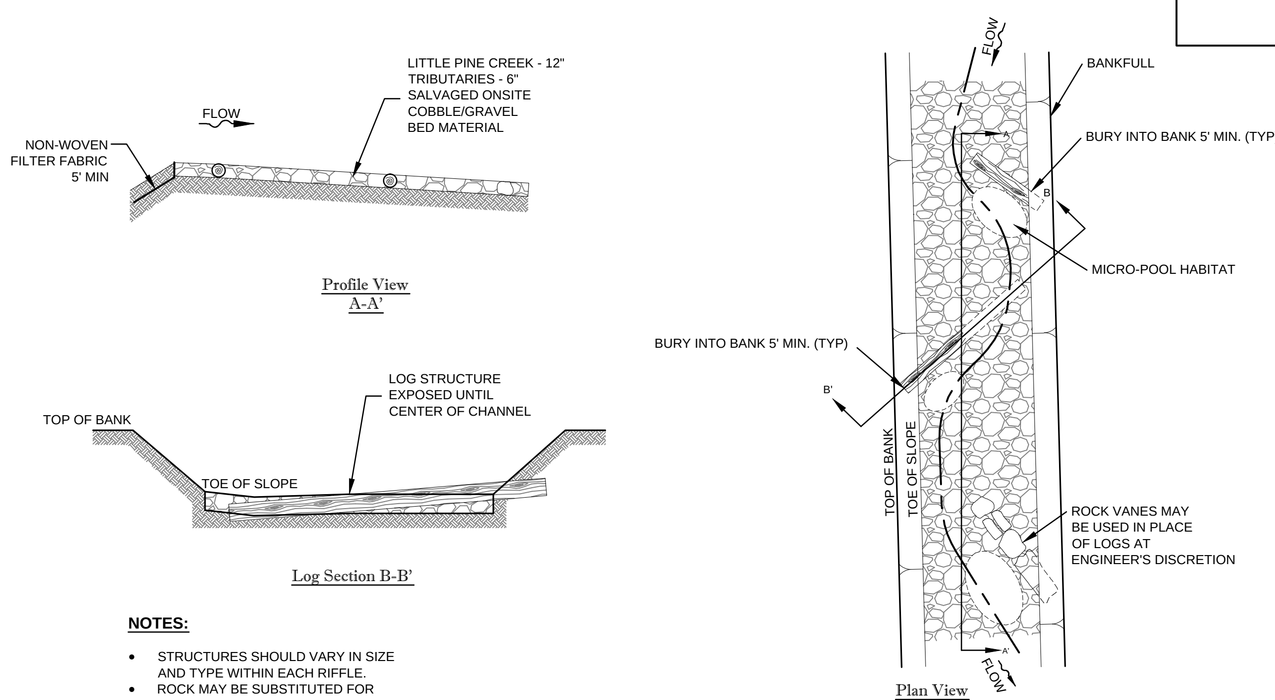


1
5.1 Constructed Riffle
Not to Scale



2
5.1 Woody Riffle
Not to Scale

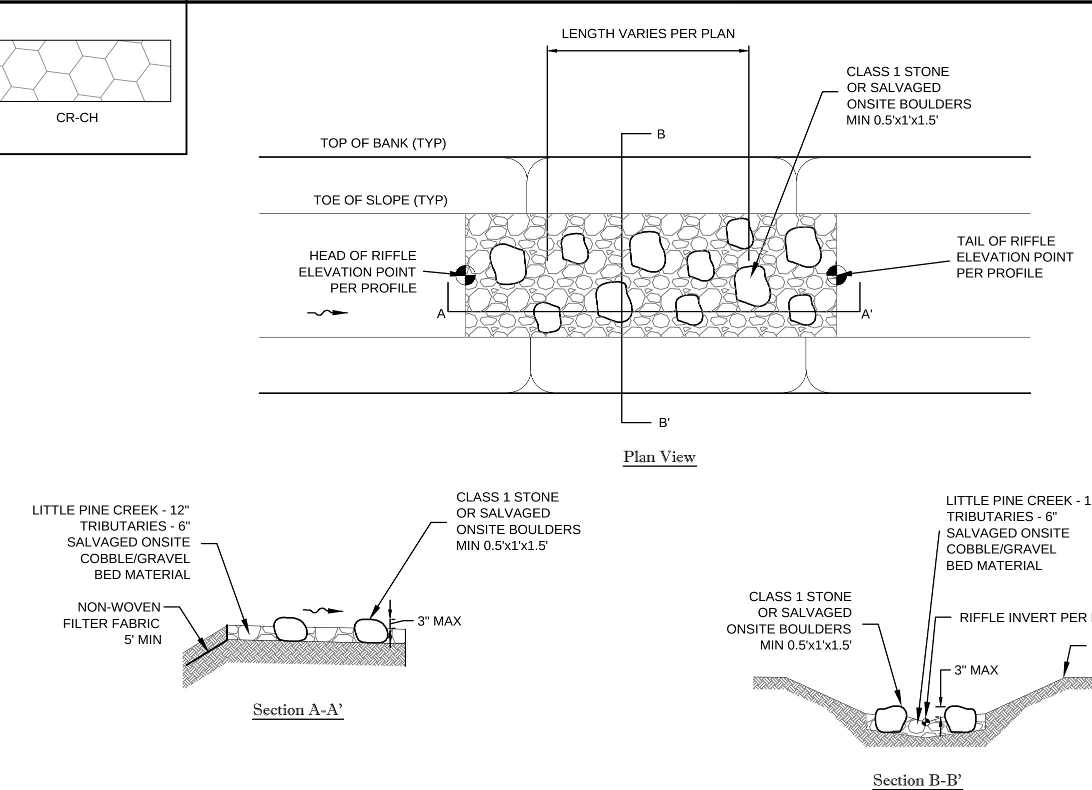




NOTES:

- STRUCTURES SHOULD VARY IN SIZE AND TYPE WITHIN EACH RIFFLE.
- ROCK MAY BE SUBSTITUTED FOR LOGS AT ENGINEER'S DISCRETION.
- SEE PROFILE FOR LENGTH AND SLOPE OF RIFFLE.

3
5.1 Jazz Riffle Structure
Not to Scale



4
5.1 Chunky Riffle
Not to Scale

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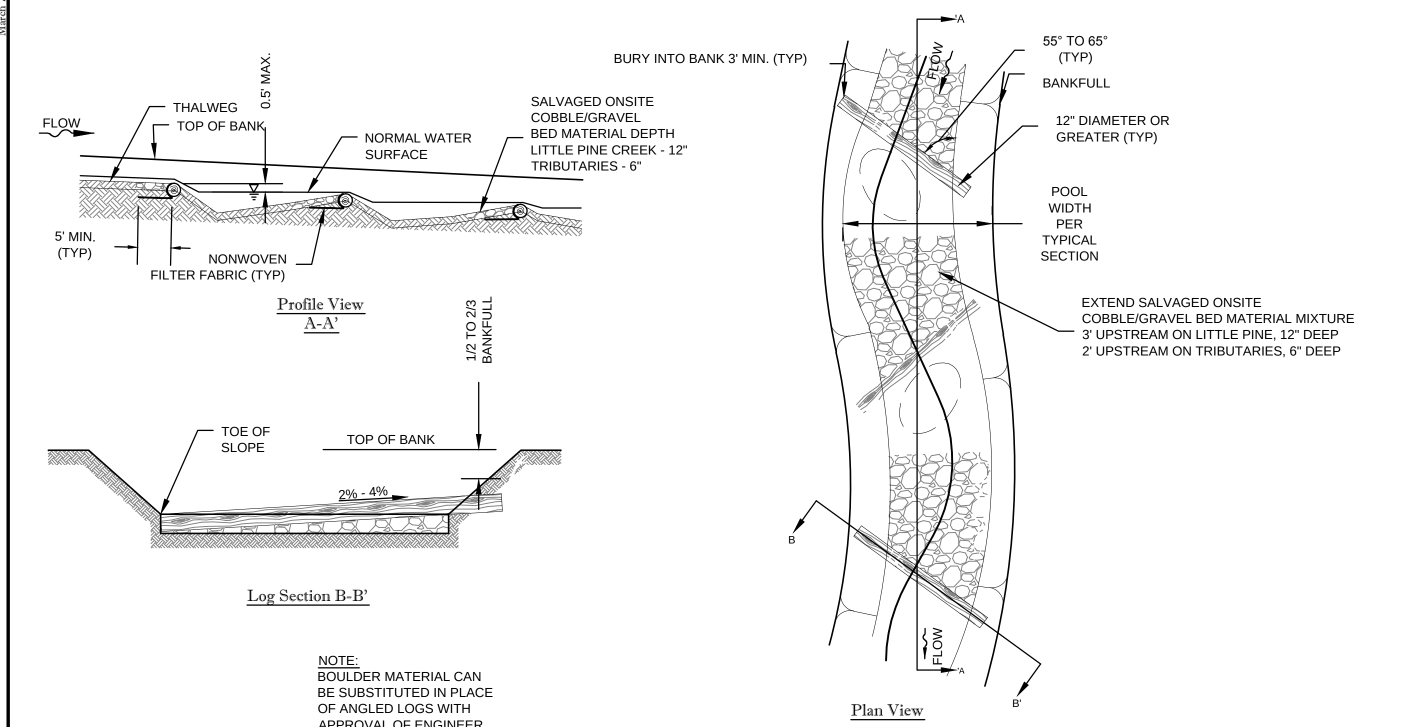
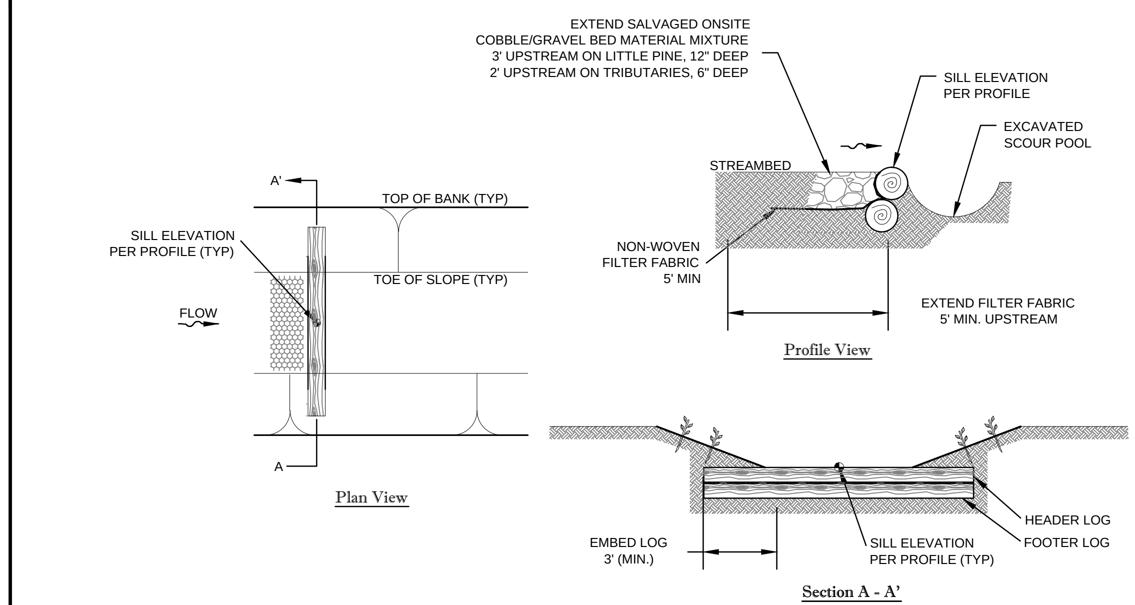
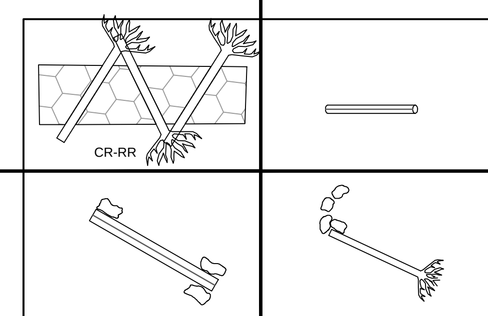
5.1
Sheet

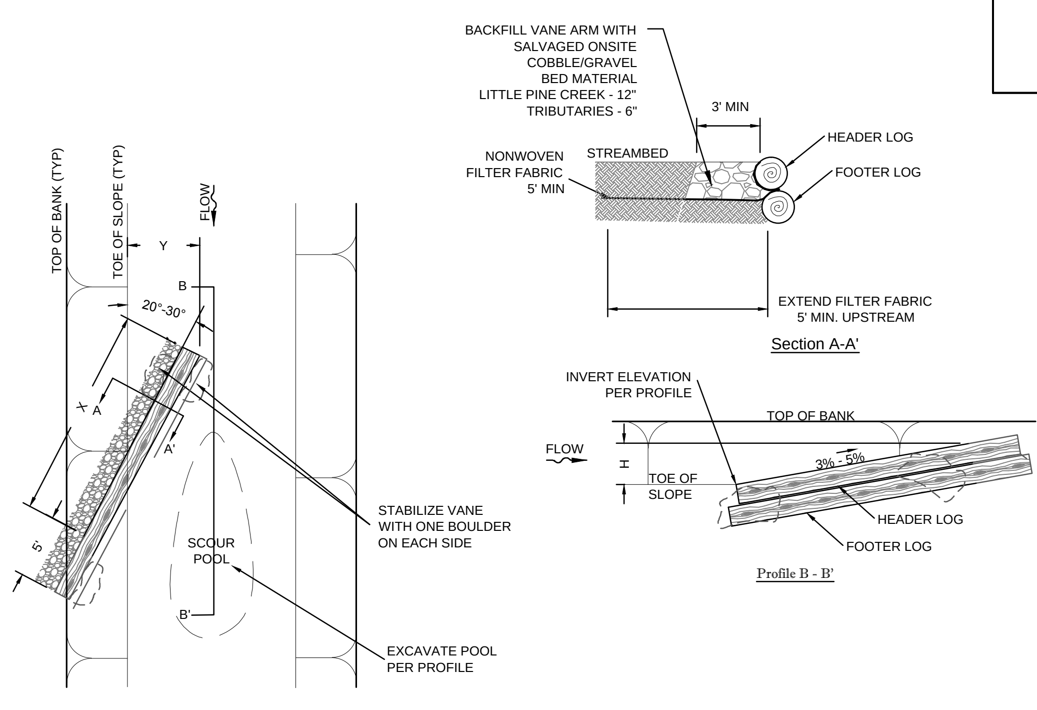


1
5.2
Rock and Roll Riffle
Not to Scale

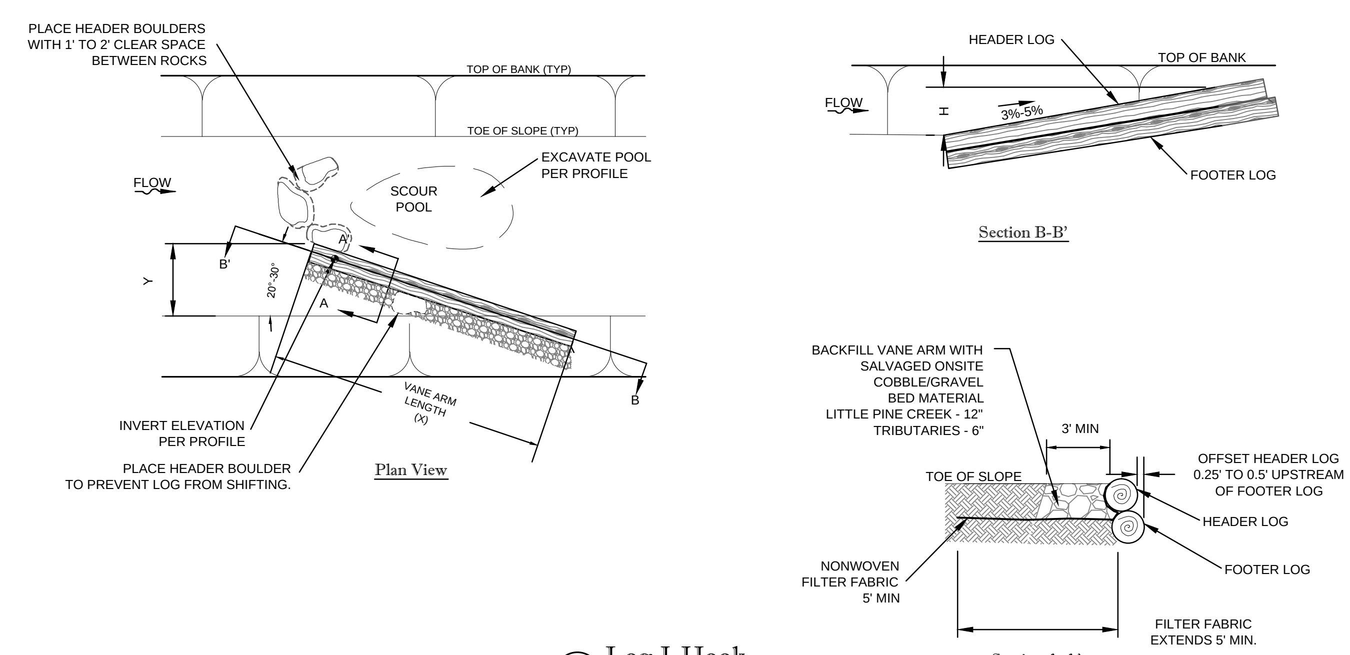


2
5.2
Log Sill
Not to Scale





3
5.2
Log Vane
Not to Scale



4
5.2
Log J-Hook
Not to Scale

March 7, 2012

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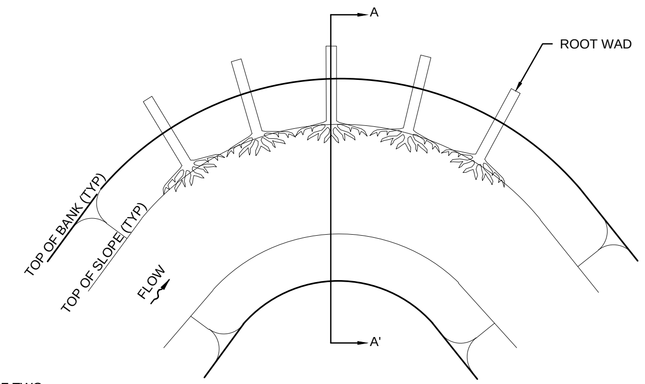
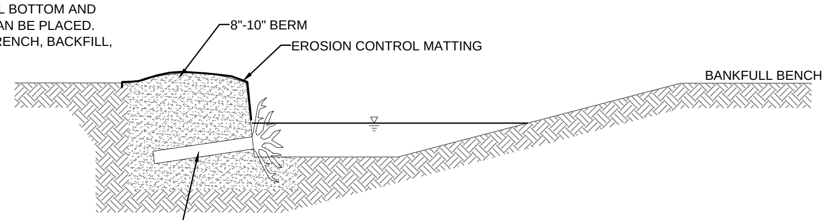


Plan View

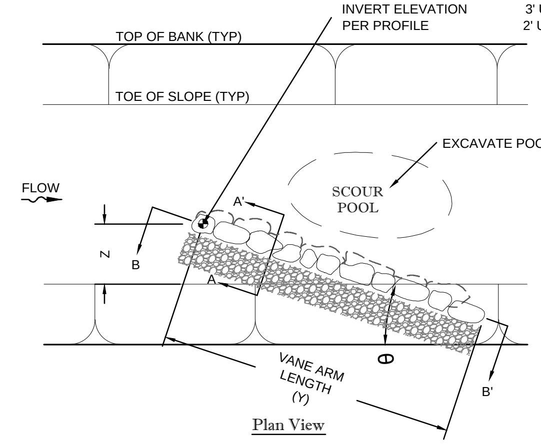
ROOT WAD INSTALLATION:

1. EXCAVATE A TRENCH A MINIMUM OF TWO TIMES THE WIDTH OF THE TRUNK AND DEEP ENOUGH SUCH THAT 1/3 OF THE ROOTMASS IS BELOW THE CHANNEL BOTTOM AND THAT A FOOTER LOG CAN BE PLACED.
2. PLACE ROOT WAD IN TRENCH, BACKFILL, AND COMPACT.

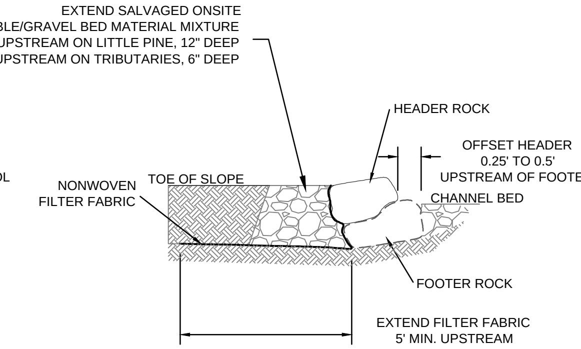


Section A-A'

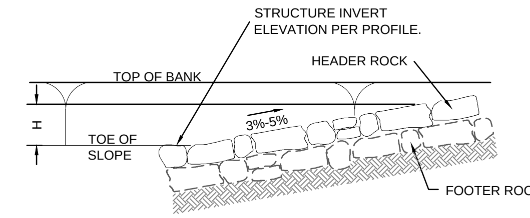
1/5.3 Root Wad
Not to Scale



Plan View



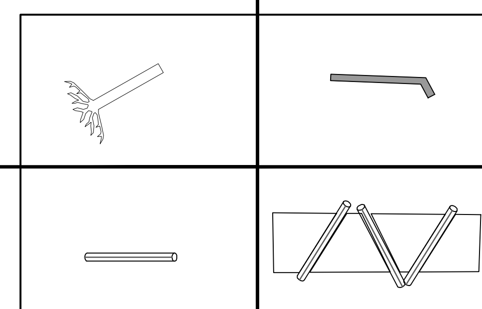
Section A-A'

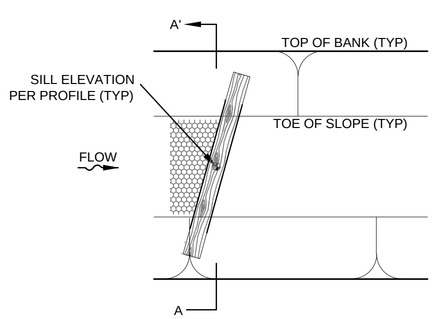


Profile View B-B'

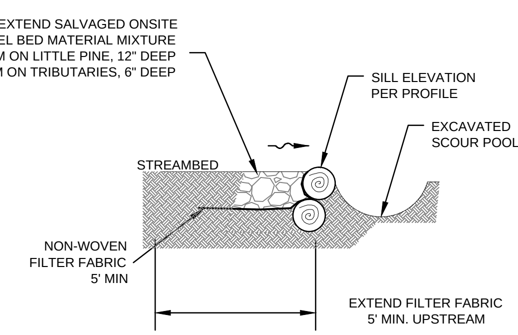
NOTE: DIMENSIONAL VALUES LISTED ON SHEET 5.8.

2/5.3 Rock Vane
Not to Scale

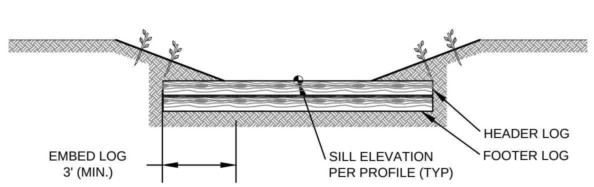




Plan View

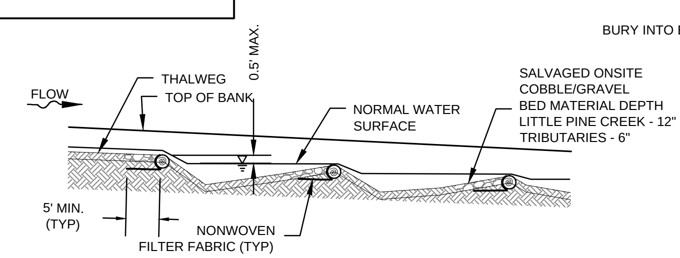


Profile View

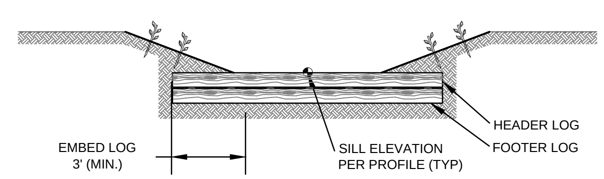


Section A - A'

3/5.3 Angled Log Drop
Not to Scale

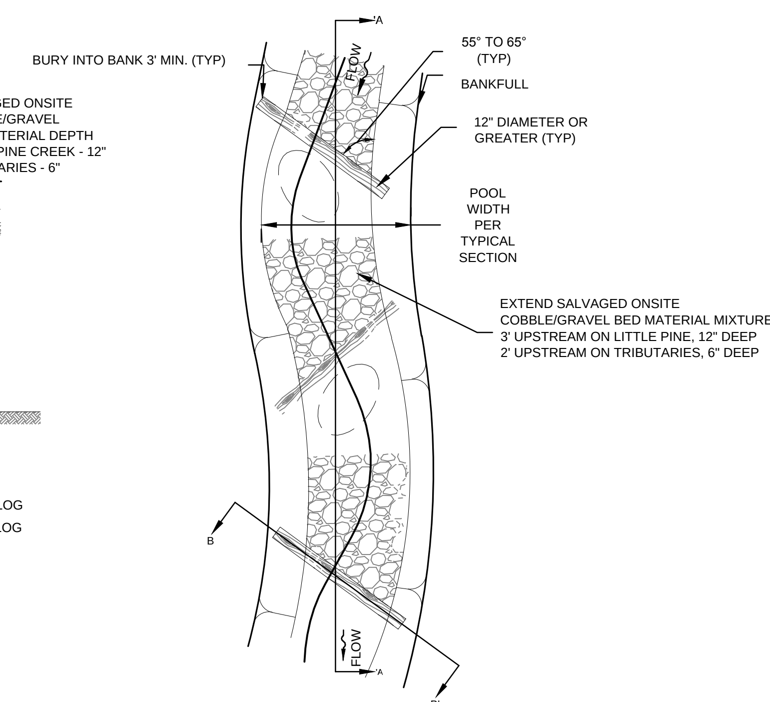


Profile View
A-A'



Log Section B-B'

NOTE:
BOULDER MATERIAL CAN BE SUBSTITUTED IN PLACE OF ANGLED LOGS WITH APPROVAL OF ENGINEER.



Plan View

4/5.3 Angled Log Drop Sequence
Not to Scale

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SCO Project No.:	07-07088-03

5.3
Sheet

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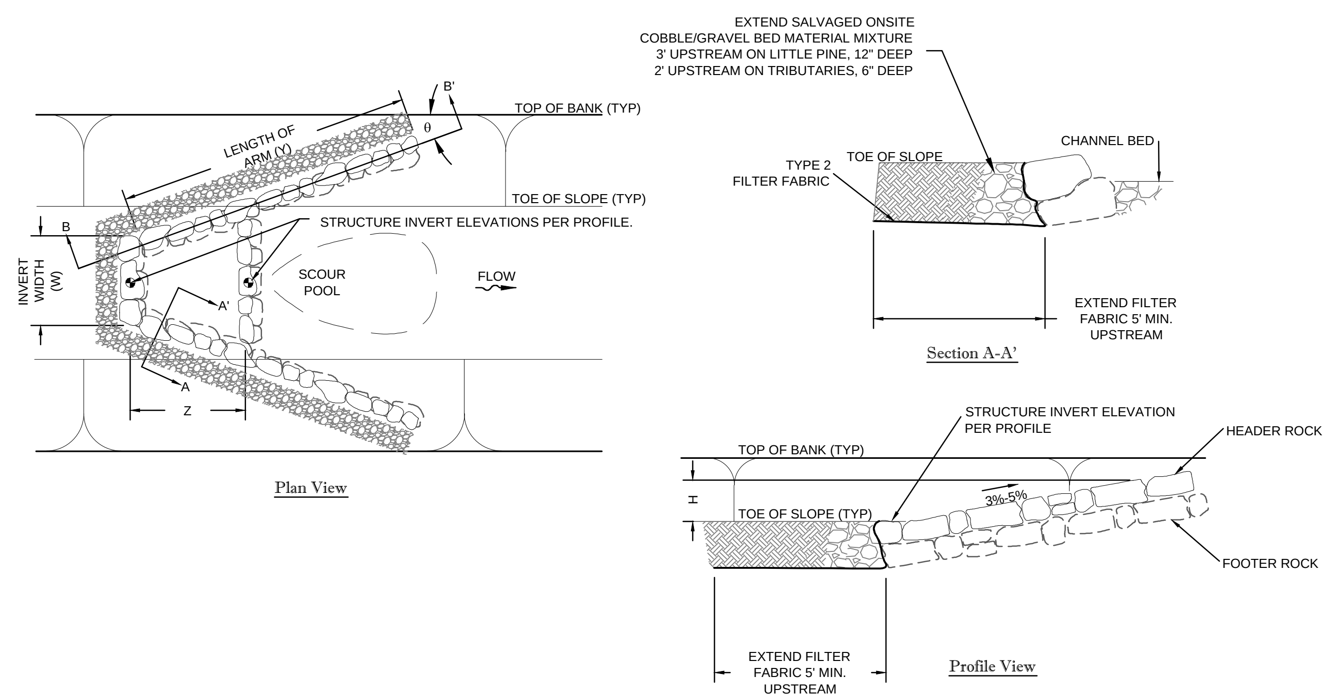
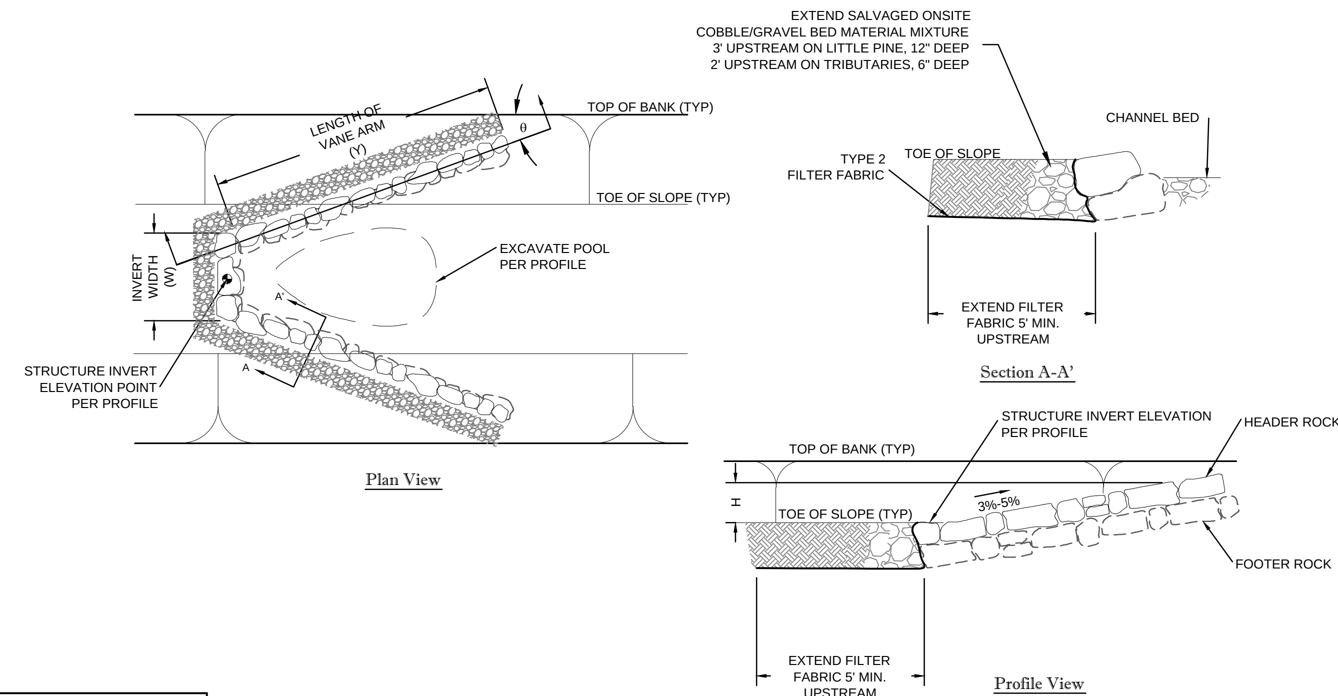
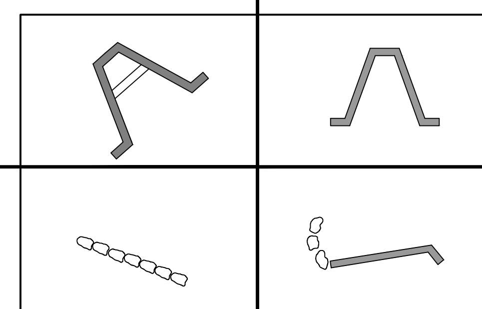
March 7, 2012

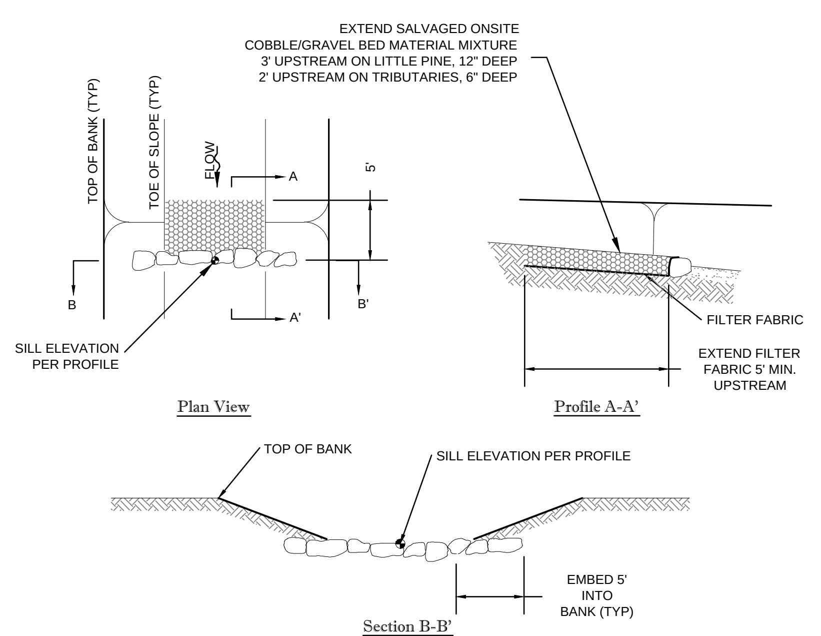


1 5.4 **Rock A Vane**
Not to Scale

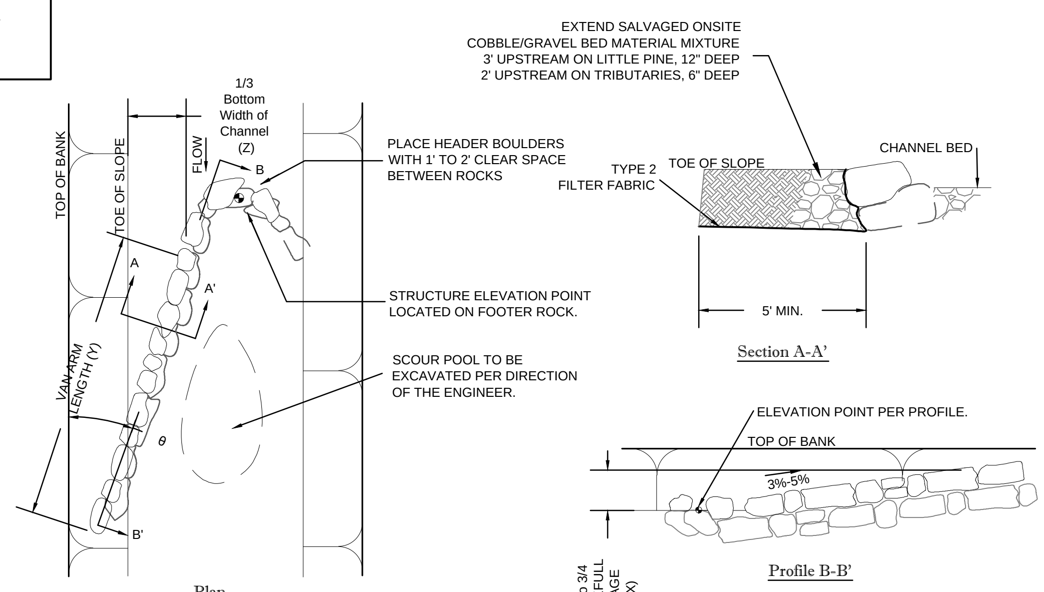


2 5.4 **Rock Cross Vane**
Not to Scale





3 5.4 **Boulder Sill**
Not to Scale



4 5.4 **Rock J-Hook**
Not to Scale

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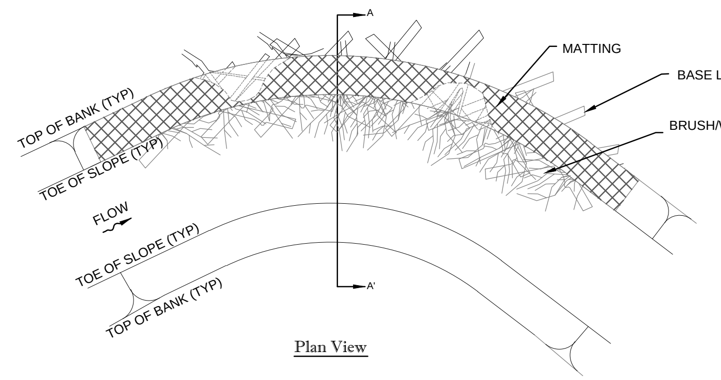
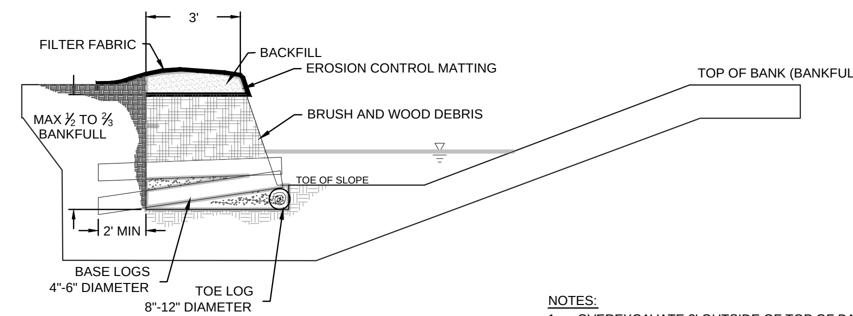


Plan View



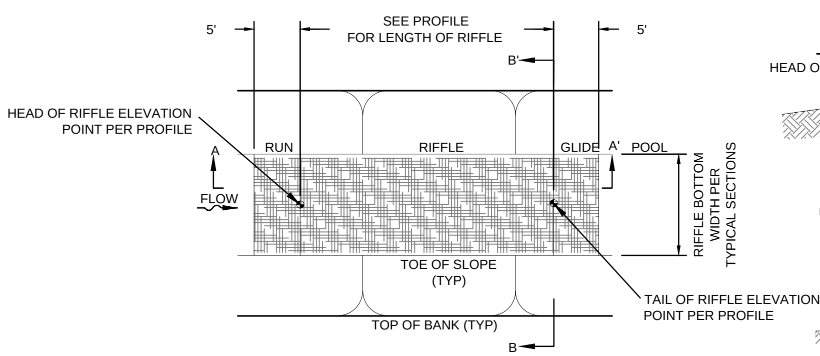
Section A-A'

NOTES:

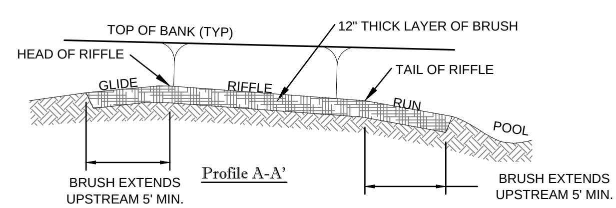
1. OVEREXCAVATE 3' OUTSIDE OF TOP OF BANK (BANKFULL).
2. INSTALL TOE LOG 8"-12" IN DIAMETER AS SHOWN IN DETAIL.
3. INSTALL BASE LOGS IN A CRISS CROSS PATTERN, DRIVING THEM INTO THE EXISTING BANK A MINIMUM OF 2'. BASE LOGS SHALL BE 4"-6" DIAMETER.
4. INSTALL A LAYER OF ONSITE GRAVEL ON TOP OF THE BASE LOGS. LIGHTLY SPREAD ONSITE GRAVEL TO FILL VOIDS BETWEEN BASE LOGS. AVOID HEAVY COMPACTION TO PREVENT DAMAGE TO THE BASE LOGS.
5. INSTALL A LAYER OF BRUSH/WOODY DEBRIS, WHICH SHALL CONSIST OF SMALL BRANCHES AND ROOTS COLLECTED ON-SITE TO DEPTH OF 1 FOOT ABOVE D/S HEAD OF RIFFLE. LIGHTLY COMPACT BRUSH/WOODY DEBRIS LAYER.
6. BRUSH SHOULD BE ALIGNED SO STEMS ARE ROUGHLY PARALLEL AND IS INSTALLED POINTING SLIGHTLY UPSTREAM.
7. INSTALL EARTH BACKFILL OVER FINAL BRUSH/WOODY LAYER ACCORDING TO TYPICAL SECTION DIMENSIONS.
8. INSTALL EROSION CONTROL MATTING AND BANK STABILIZATION PER PLANS.

1 / 5.5 Brush Toe

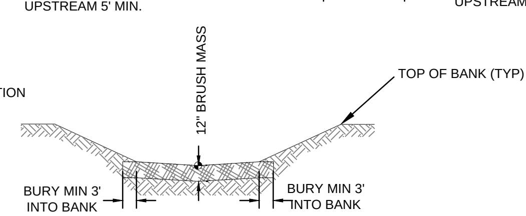
Not to Scale



Plan View



Profile A-A'



Section B-B'

2 / 5.5 Brush Riffle

Not to Scale

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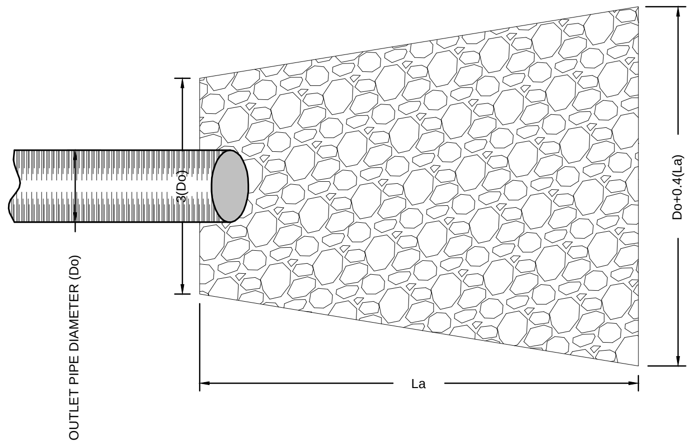
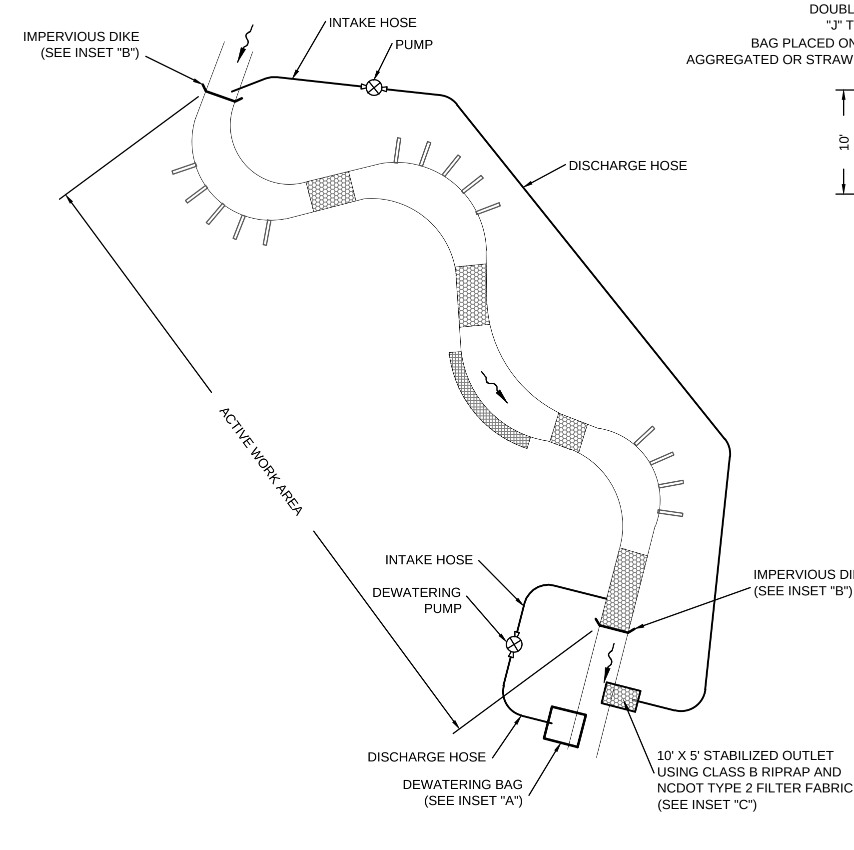
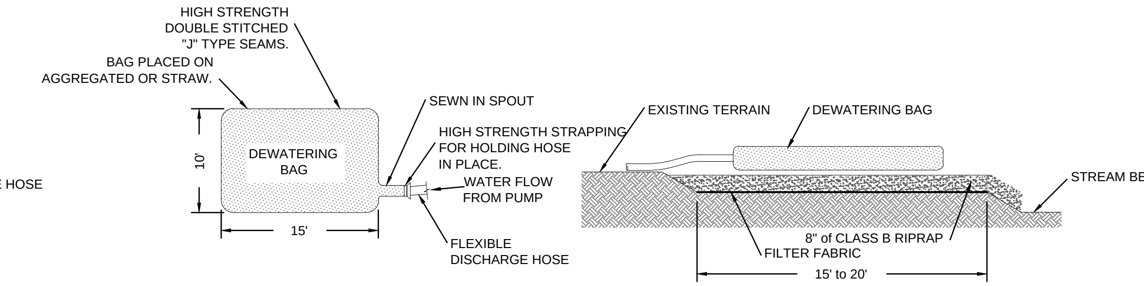


1 / 5.6 **Outlet Protection**
Not to Scale



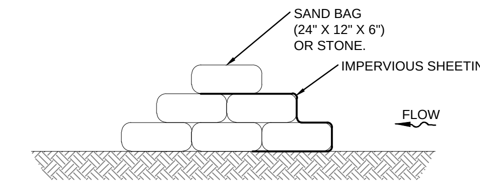
Plan View



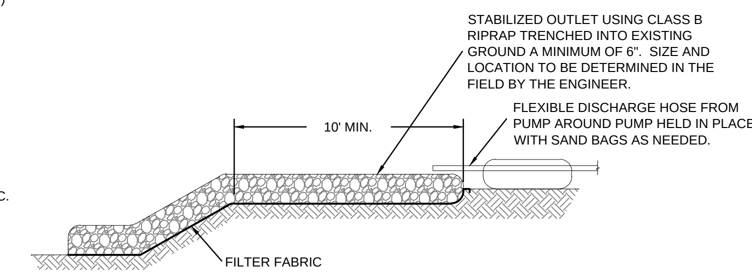
Inset "A"
Dewatering Bag

NOTE:

1. PROVIDE STABILIZED OUTLET TO STREAMBED.

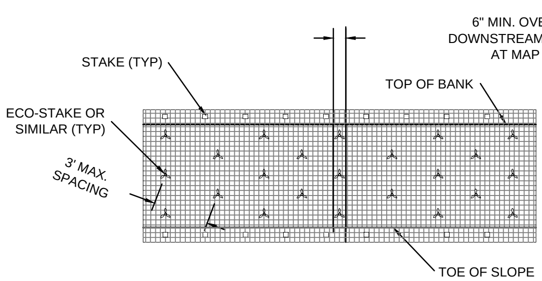


Inset "B"
Impervious Dike

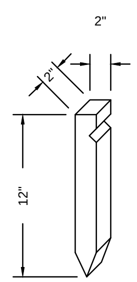


Inset "C"
Stabilized Outlet

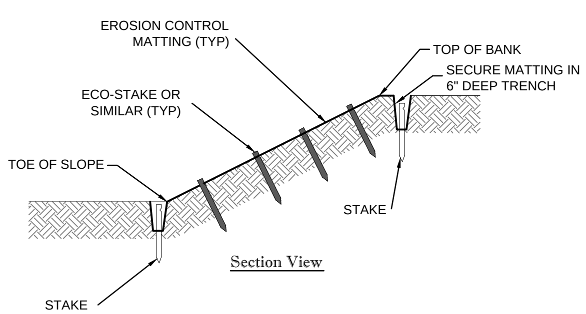
2 / 5.6 **Pump Around System**
Not to Scale



Plan View

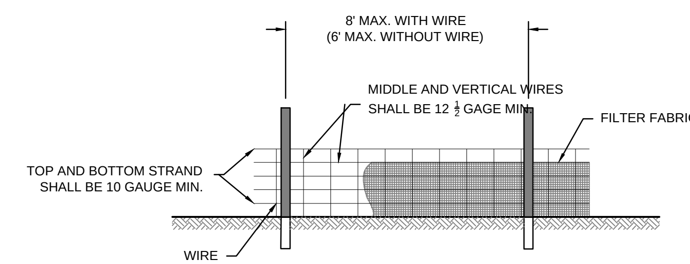


Typical Stake



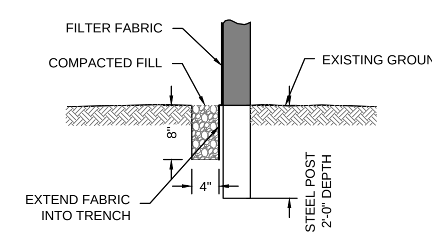
Section View

3 / 5.6 **Erosion Control Matting**
Not to Scale



NOTES:

1. USE WIRE A MINIUM OF 32" IN WIDTH AND WITH A MINIMUM OF 6 LINES OF WIRES WITH 12" STAY SPACING.
2. USE FILTER FABRIC A MINIMUM OF 36" IN WIDTH AND FASTEN ADEQUATELY TO THE WIRES AS DIRECTED BY THE ENGINEER.
3. PROVIDE 5' STEEL POST OF THE SELF-FASTENER ANGLE STEEL TYPE. ANGLE STEEL TYPE.



4 / 5.6 **Temporary Silt Fence**
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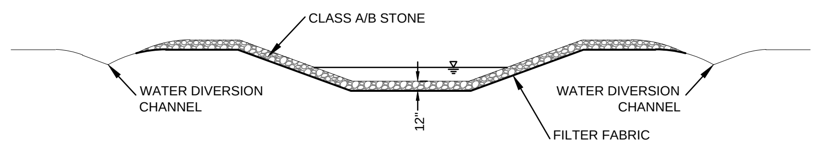
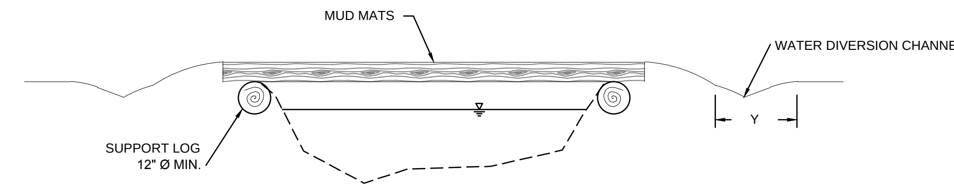


NOTES:

1. FORD CROSSING SHALL BE INSTALLED PERPENDICULAR TO CHANNEL BANKS.
2. MAINTAIN DIVERSION CHANNEL TO INSURE RUNOFF DOES NOT ENTER CHANNEL.
3. CONTRACTOR SHALL DETERMINE APPROPRIATE FORD DIMENSIONS.

1/5.7 Permanent Ford Crossing

Not to Scale

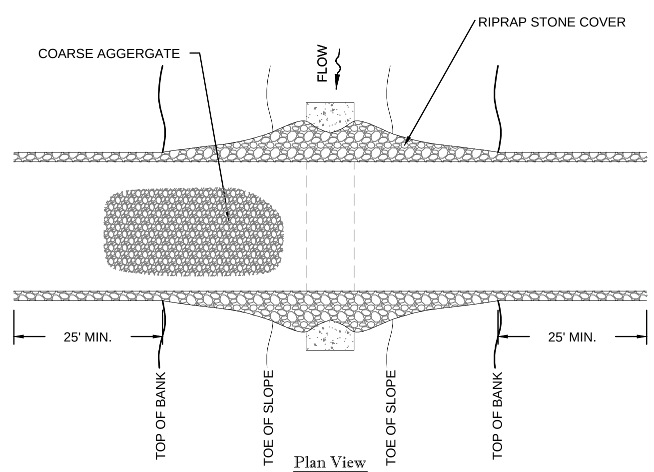


NOTE:

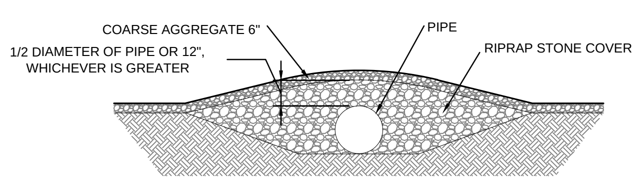
1. CONSTRUCT STREAM CROSSING WHEN FLOW IS AT NORMAL BASEFLOW.
2. MINIMIZE CLEARING AND EXCAVATION OF STREAMBANKS. DO NOT EXCAVATE CHANNEL BOTTOM.
3. INSTALL STREAM CROSSING PERPENDICULAR TO THE FLOW.
4. MAINTAIN CROSSING SO THAT RUNOFF IN THE CONSTRUCTION ROAD DOES NOT ENTER EXISTING CHANNEL.
5. CONTRACTOR SHALL DETERMINE AN APPROPRIATE RAMP ANGLE ACCORDING TO EQUIPMENT UTILIZED.

2/5.7 Temporary Stream Crossing - Mud Mat

Not to Scale



Plan View



Section View

3/5.7 Permanent Stream Crossing - Culvert

Not to Scale

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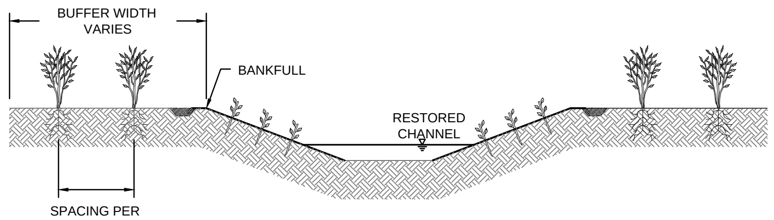
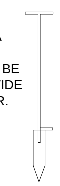


Section View


DIBBLE BAR

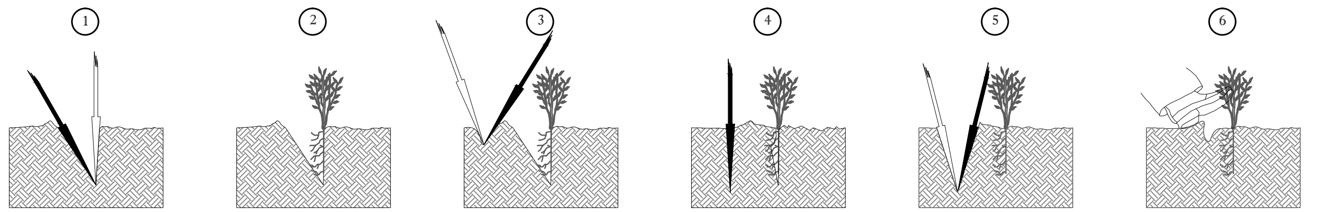
PLANTING BAR SHALL HAVE A BLADE WITH A TRIANGULAR CROSS-SECTION, AND SHALL BE 12 INCHES LONG, 4 INCHES WIDE AND 1 INCH THICK AT CENTER.

ROOTING PRUNING

ALL ROOTS SHALL BE PRUNED TO AN APPORIATE LENGTH TO PREVENT J-ROOTING.

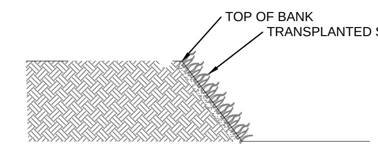
NOTES:

1. ALL SOILS WITHIN THE BUFFER PLANTING AREA SHALL BE DISKED, AS REQUIRED, PRIOR TO PLANTING.
2. ALL PLANTS SHALL BE PROPERLY HANDLED PRIOR TO INSTALLATION TO INSURE SURVIVAL.

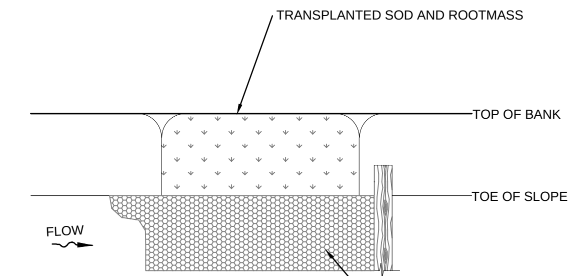


1. INSERT THE DIBBLE, OR SHOVEL, STRAIGHT DOWN INTO THE SOIL TO THE FULL DEPTH OF THE BLADE AND PULL BACK ON THE HANDLE TO OPEN THE PLANTING HOLE. (DO NOT ROCK THE SHOVEL BACK AND FORTH AS THIS CAUSES SOIL IN THE PLANTING HOLE TO BE COMPACTED, INHIBITING ROOT GROWTH.
2. REMOVE THE DIBBLE, OR SHOVEL, AND PUSH THE SEEDLING ROOTS DEEP INTO THE PLANTING HOLE. PULL THE SEEDLING BACK UP TO THE CORRECT PLANTING DEPTH (THE ROOT COLLAR SHOULD BE 1 TO 3 INCHES BELOW THE SOIL SURFACE). GENTLY SHAKE THE SEEDLING TO ALLOW THE ROOTS TO STRAIGHTEN OUT. DO NOT TWIST OR SPIN THE SEEDLING OR LEAVE THE ROOTS J-ROOTED.
3. INSERT THE DIBBLE, OR SHOVEL, SEVERAL INCHES IN FRONT OF THE SEEDLING AND PUSH THE BLADE HALFWAY INTO THE SOIL. TWIST AND PUSH THE HANDLE FORWARD TO CLOSE THE TOP OF THE SLIT TO HOLD THE SEEDLING IN PLACE.
4. PUSH THE DIBBLE, OR SHOVEL, DOWN TO THE FULL DEPTH OF THE BLADE.
5. PULL BACK ON THE HANDLE TO CLOSE THE BOTTOM OF THE PLANTING HOLD. THEN PUSH FORWARD TO CLOSE THE TOP, ELIMINATING AIR POCKETS AROUND THE ROOT.
6. REMOVE THE DIBBLE, OR SHOVEL, AND CLOSE AND FIRM UP THE OPENING WITH YOUR HEEL. BE CAREFUL TO AVOID DAMAGING THE SEEDLING.

1/5.8 Bare Root Planting
Not to Scale



Section View
Riffle Installation

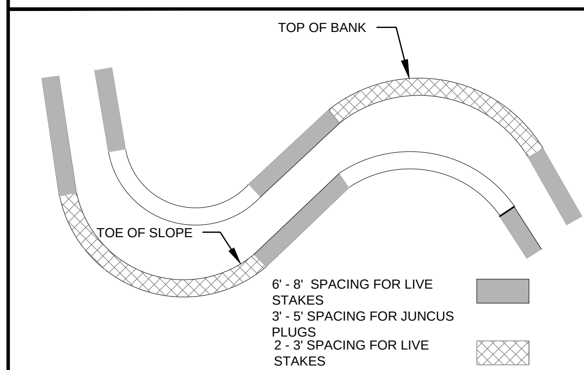


Plan View
Riffle Installation

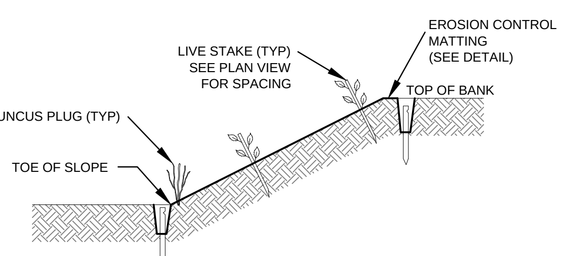
NOTES:

1. PREPARE THE BANK WHERE THE SOD MAT WILL BE TRANSPLANTED BY RAKING & FERTILIZING.
2. EXCAVATE TRANSPLANT SOD MATS WITH A WIDE BUCKET AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE.
3. PLACE TRANSPLANT ON THE BANK TO BE STABILIZED.
4. SECURE WITH SOD STAPLES.
5. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
6. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
7. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

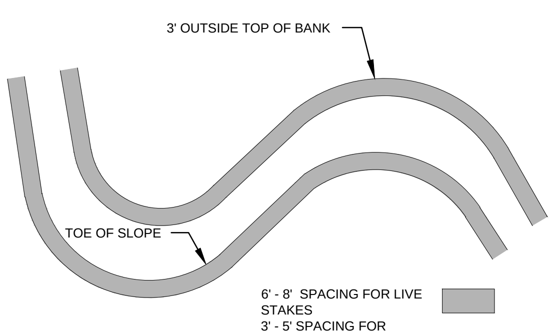
2/5.8 Transplanted Sod Mats
Not to Scale



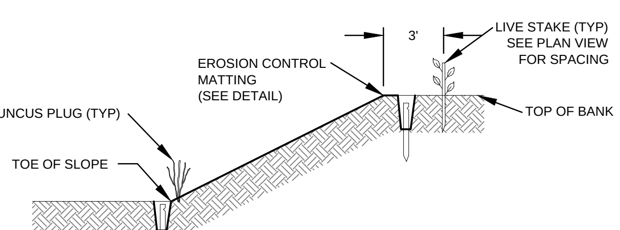
Plan View - Large Streams



Section View - Large Streams
Little Pine Creek



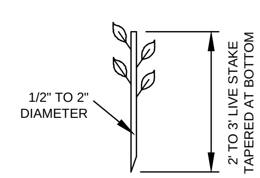
Plan View - Small Streams



Section View - Small Streams
Tributaries

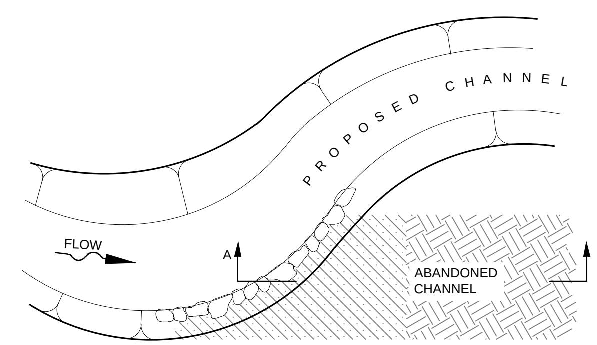
NOTE:

1. LIVE STAKES TO BE PLANTED IN AREAS AS SHOWN ON PLANS AND DIRECTED BY THE ENGINEER.

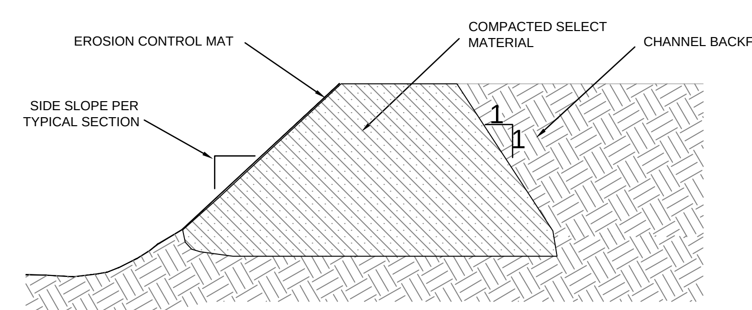


Live Stake Detail

3/5.8 Live Staking & Juncus Plugs
Not to Scale



Plan View



Section A-A'

2/5.8 Channel Plug
Not to Scale

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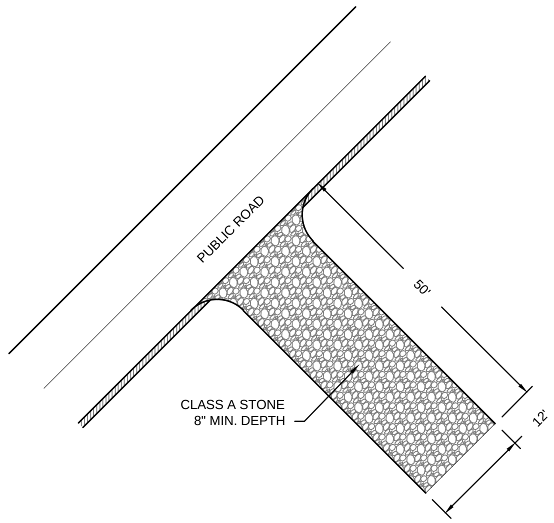


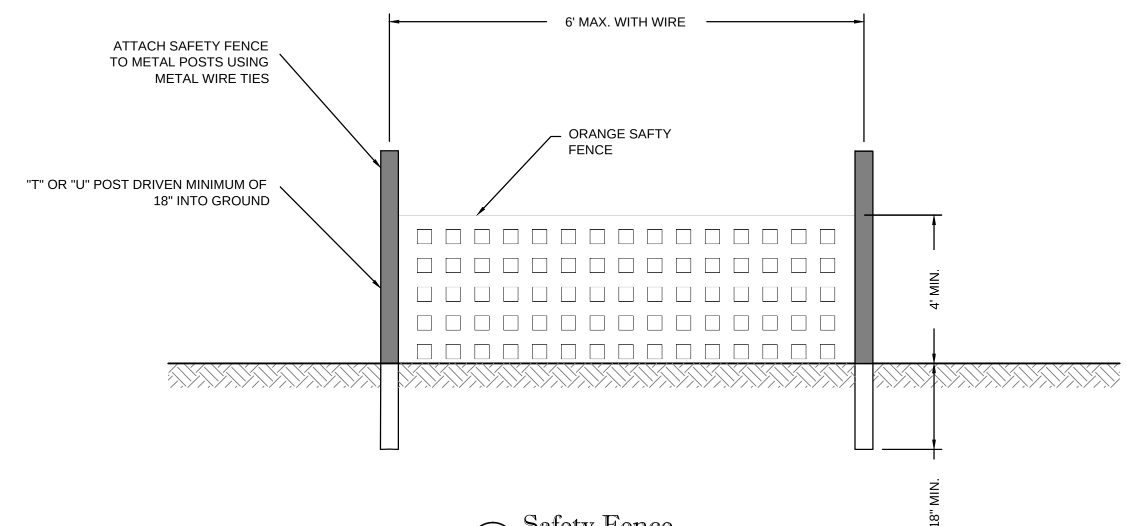
NOTES:

1. PROVIDE TURNING RADIUS SUFFICIENT TO ACCOMMODATE LARGE TRUCKS.
2. LOCATE CONSTRUCTION ENTRANCE AT ALL POINTS OF INGRESS AND EGRESS UNTIL SITE IS STABILIZED. PROVIDE FREQUENT CHECKS OF THE DEVICE AND TIMELY MAINTENANCE.
3. MUST BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR DIRECT FLOW OF MUD ONTO STREETS. PERIODIC TOP DRESSING WITH STONE WILL BE NECESSARY.
4. ANY MATERIAL TRACKED ONTO THE ROADWAY MUST BE CLEANED IMMEDIATELY.
5. USE CLASS A STONE OR OTHER COARSE AGGREGATE APPROVED BY THE ENGINEER.
6. PLACE FILTER FABRIC BENEATH STONE.

1
5.9
Construction Entrance
Not to Scale

MATERIAL SPECIFICATIONS

PHYSICAL PROPERTY	TESTS	REQUIREMENTS
MATERIAL	N/A	POLYETHYLENE
RECOMENDED COLOR	N/A	"INTERNATIONAL ORANGE"
TENSILE YIELD	ASTM D638	AVE. 2000 LBS. PER 4' WIDE
ULTIMATE TENSILE STRENGTH	ASTM D638	AVE. 2900 LBS. PER 4' WIDE
ELONGATION AT BREAK (%)	ASTM D638	GREATER THAN 1000%
CHEMICAL RESISTANCE	N/A	INERT TO MOST CHEMICALS AND ACIDS



2
5.9
Safety Fence
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Drawn By:	JCK
Checked By:	EGR
SCO Project No.:	07-07088-03

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